UNITY4650

Digital Media Receiver/Decoder

User's Manual

WEGENER

A proven world leader in digital video, audio & broadcast data systems, WEGENER's management system is certified to ISO 9001:2000.

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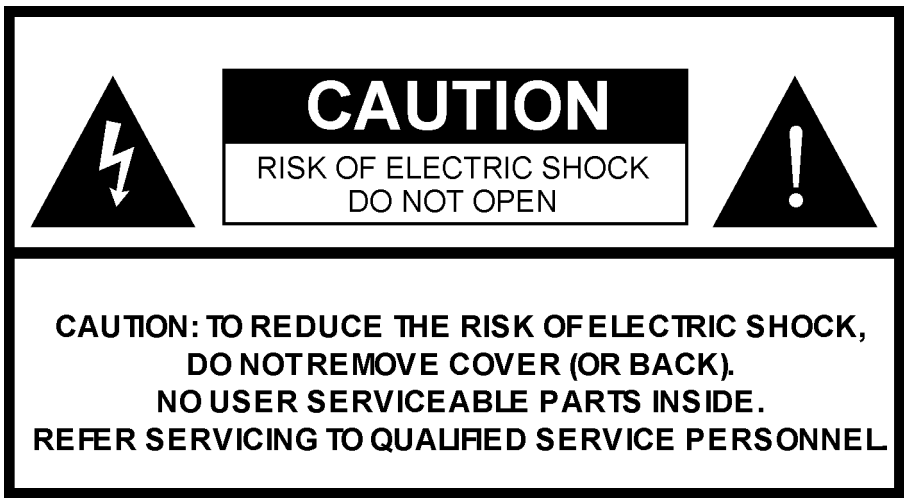
The Wegener Unity 4650 is approved under FCC Part 15B Class A, UL/C-UL1950 3rd Edition, and CE [EN60950, EN55022(94), and EN55024(98)].

CE


CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

CAUTION

As this unit is intended to interface with other electrical/electronic systems, proper engineering practices must be adhered to during installation and check-out.

All AC power and ground must be installed in accordance with National Electric Code Standards as to conductor size and limitations (see NFPA 70, articles 200-280, as amended, if required), and lightning protection must be provided.

All RF interconnections must be properly shielded to prevent ingress or egress of potential interfering sources to existing services.

Any damage to this unit caused by improper wiring/interconnections will void any warranty extended.

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Table of Contents

Chapter 1 General Information

1.1 Manual Overview 7
1.2 U4650 Overview 8
Functional Description 8
Physical Description 8
Figure 1.1 The Unity 4650 Digital Media Receiver/Decoder . . 8
1.3 U4650 Specifications 9
Table 1 Technical Specifications 9
Table 2 Transport In Options 14
1.4 Safety Summary 19
1.5 Glossary of Terms and Abbreviations 19
Table 3 Glossary of Terms 19

Chapter 2 Installation

2.1 Unpacking and Inspection 25
2.2 Location and Mounting 25
FCC-mandated suppression of radiated emissions 25
Rack Mounting 27
Desktop Installation 27
2.3 U4650 Connections 28
Figure 2.1 U4650 Rear-panel Connector Locations 28
Figure 2.2 U4650 Transport In Options 29
Table 4 Rear-panel Connectors 30
Table 5 Front-panel Connectors 32
2.4 Serial Port Configuration 33
Device assignments 33
Device configurations 33
Table 6 Device Configurations. 33
Device handling 34
2.5 Installation Testing 35
RF input check 35
Audio/video check 36
Relay Pulse Check 36

Chapter 3 Operation

3.1 Theory of Operation 37
Functional summary 37
Automated recovery 38
Monitoring and control 38
Figure 3.1 Unity 4650 Functional Block Diagram 39

3.2 Operation from Front Panel 40
Front-panel layout 40
Figure 3.2 U4650 Front-panel Layout. 40
LCD screen relationships. 41
Figure 3.3 LCD Screen Relationships 41
LCD screen content 41
Figure 3.4 Unity 4650 Top-level Screens 42
Home and default screens 44
Interpreting LEDs 45
Figure 3.5 LED Indicators 45
Table 7 Front-panel LED Indicator Descriptions 45
Front-panel audio monitor 47
3.3 Operation from Local/Remote Terminal 48
Overview and syntax 48
User commands 48

Chapter 4 Maintenance and Troubleshooting

4.1 Maintenance. 73
4.2 General Troubleshooting 73
No output or indications 73
No audio or video output 74
Missing an audio or video output while others are okay. 74
4.3 Alarms and Warnings 75
Table 8 Alarm and Warning Descriptions 75

Chapter 5 Customer Service

5.1 Warranty 83
5.2 Technical Support 83

Appendix A Monitoring and Control Details

A.1 Basic Navigation. 85
A.2 Info Screens 85
A.3 Menu Screens 86
A.4 Parameter Screens. 87

Index

Chapter 1 General Information

1.1 Manual Overview

This manual provides instructions and reference information for the proper installation and operation of the Wegener Model Unity 4650 Digital Media Receiver/Decoder, referred to throughout this manual as the Model U4650 or U4650.

The manual is divided into the following chapters:

1 General Information - a description of your U4650, its functions and specifications, and a glossary of terms.

2 Installation - procedures and information for the correct and safe installation of your U4650.

3 Operation - instructions for starting and operating your U4650.

4 Maintenance and Troubleshooting - information about maintaining your U4650 and resolving possible operating difficulties.

5 Customer Service - Our warranty and information on obtaining help.

An **Index** of keywords is also provided to help you quickly locate needed information.

Please e-mail any suggestions or comments concerning this manual to manuals@wegener.com. If you prefer to post them through the mail, please send your comments to the address below. If you have substantial or complex changes to recommend, our preference is that you copy the page(s) in question, mark your changes on that copy, and fax or mail us the copy. We always appreciate constructive criticism.

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1.2 U4650 Overview

Functional Description

The Wegener Model Unity 4650 Digital Media Receiver/Decoder is a fully DVB-compliant satellite video IRD. The U4650 receives an L-band RF carrier from an external LNB (or, if configured as a decoder, accepts ASI transport from a terrestrial source), extracts the MPEG transport stream, and provides the decompressed program content to analog audio/video and (optional) digital audio/video outputs.

Features include:

- •Control by local user (terminal or front-panel) or remote COMPEL® system
- •Download of software application upgrades via satellite (with backup application storage)
- •Supports COMPEL®/CA conditional access at transport level or by program
- •Supports receiver card options using either DVB-QPSK and/or Advanced Turbo-Modulations (Turbo-QPSK, T-8PSK, or T-16QAM)
- •Supports optional ASI Transport Input card (for decoder-only functioning)
- •Supports ISO 13818-1 transport rates from 2.5 to 100 Mbps
- •Local decompression of MPEG-2 video (4:2:2P@ML or 4:2:0 MP@ML)
- •Auto-recognition and support of 525-line NTSC or 625-line PAL
- •Supports 4:3 or 16:9 aspect ratio, including re-scaling of 16:9 down to 4:3
- •Local decompression of two independent audios per MPEG-2 (L1 or L2)\
- •Optional support of SMPTE302 uncompressed audio pass-through
- •VBI data supported in extended video window (4:2:2P@ML only) or re-inserted by IRD
- •Pro Option support: SDI with two stereo channels embedded audio output
- •Pro Option support: Genlock with subcarrier phase and H offset adjust
- •High-speed IP data routing output
- •Alarm relay and user-cueing relays
- •Optional front-panel audio and video monitors
- •Web browser control *(contact factory)*

Physical Description

The U4650 is housed in a standard, 1 RU, rack-mountable chassis. Its front panel (see **Figure 1.1**) provides a user interface through six push buttons and a 2x20-character LCD. It also supports optional front-panel monitors for audio and video. The rear panel holds connectors for input AC power, composite video output, Pro option genlock reference input, Pro option SDI video (w/2 embedded AES3 audio channels), Ethernet port, serial port, alarm and user cue relays, and two analog balanced audio pairs. The unit also includes two Unity expansion option module slots.

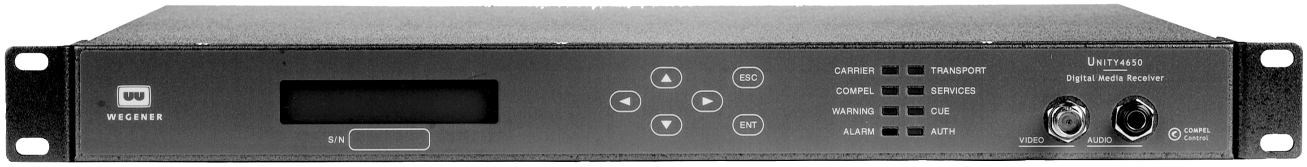

Figure 1.1 The Unity 4650 Digital Media Receiver/Decoder

1.3 U4650 Specifications

Table 1: Technical Specifications

Characteristic	Specification
POWER	
Voltage	90-132 or 175-264 VAC auto-detect/selected
Frequency	60/50 Hz ± 2%
Consumption	With full LNB DC load, PRO option, & QPSK receiver card: 30 W typical power dissipation 45 VA typical line loading
TRANSPORT IN OPTIONS	See **Table 2: Transport In Options** on page 14
CONDITIONAL ACCESS	
Wegener COMPEL®/CA	Transport-level or by program
PIN Scrambling	
TRANSPORT DEMULTIPLEXING	
Aggregate MPEG Transport Rate	2.5 to 100 Mbps if not limited by symbol-rate for given modulation and FEC.
Number of Programs	Unlimited
PSI Recognition	Automatic
VIDEO DECODER	
Compression System	MPEG 2 (includes legacy MPEG 1)
Supported Chrominance Sampling	4:2:0 MP@ML 4:2:2 P@ML
Video ES rate	50 Mbps max (15Mbps for 4:2:0)
Analog Output Format	NTSC composite per SMPTE170M PAL (B,G,H,I) composite per CCIR 624
Supported Digital Video Resolutions	Horizontal: 720, 704, 640, 544, 480, 352 pixels NTSC Vertical lines: 512 (4:2:2 sampling only), 480, 240 PAL Vertical lines: 608 (4:2:2 sampling only), 576, 288
Aspect Ratios	4:3 or 16:9. May be set to auto-detect or to force original 16:9 material to 4:3 output using pan and scan vectors supplied by MPEG encoder (as available).

Table 1: Technical Specifications

Characteristic	Specification
COMPOSITE VIDEO OUTPUT	(meets R5250C "Short Haul")
Output Level	1.0 V_{p-p}, ± 2%
Output Impedance	75 Ω
Multiburst	NTSC: From 0.5 to 4.2 MHz: ≤ ±0.3 dB PAL-B: From 0.5 to 4.8 MHz: ≤ ±0.3 dB
Differential Gain	≤ 2 IRE
Differential Phase	≤ .7°
L/C Gain Inequality	≤ ±2 IRE
L/C Delay Inequality	≤ ±20 ns
Line Time W-form Distortion	≤ .5 IRE p-p
Field Time W-form Distortion	≤ 3 IRE p-p
Video SNR Weighted	≥ 67 dB
VIDEO VERTICAL BLANKING DATA	
VBI Data Pass-thru	When using 4:2:2 chroma sampling, compression is supported down to lines 10 (NTSC) and 7 (PAL) on each composite video field.
VBI Data Re-insertion	• EIA-608 Line 21 data for both fields (CC & XDS) per ATSC (Annex A, A/53B). Also compatible with Harmonic and Tandberg proprietary protocols; • Type I and II Nielsen AMOL compatible with Tandberg proprietary protocols.
VBI Data Re-insertion Control	Wegener COMPEL control may enable/disable any or all of the above re-inserted VBI lines
AUDIO DECODERS (MAIN)	Two independent audio decompression devices (ports 1&2)
Compressed modes	MPEG-1 Layers 1 and 2, MPEG-2 Layer 2
Compressed data rates	MPEG: Up to 384 kbps ES rate
Uncompressed mode	Full-rate (AES3) digital audio per SMPTE302M, 2 channels per stream, 24-bit subframes, 48 kHz sampling
Sample Rates Supported	32, 44.1, and 48 kHz. Both Audio port 1 and port 2 must be assigned audio streams with same sample rate. If one is SMPTE302M audio, this rate is fixed at 48 kHz per above.
Stereo output routes	Normal stereo, Sum to both, L to both, and R to both

Table 1: Technical Specifications

Characteristic	Specification
AUDIO OUTPUT	
Output Level-MAX PPL	+24.0 dBm into 600 ohms @ 0 dB attenuation (+18.0 dBm is optional)
Output level adjust range	0 to 20 dB attenuation in 2 dB steps from Output Levels above
Output Impedance	Balanced: < 60 Ω
Frequency Response	20Hz to 20 kHz, + 0.5/-1.5 dB 50 Hz to 15 kHz, ± 0.5 dB
Harmonic Distortion	≤ 0.1% (1 kHz TT@1 dB below PPL)
Phase Accuracy	50 Hz to 15 kHz, ≤ ±2° from linear phase
SNR	≥ 80 dB (22 Hz to 20 kHz) unweighted
Dynamic Range	24 bits
SDI VIDEO OUTPUT (OPTION)	
Type	270 MBaud 4:2:2 13.5 MHz-sampled component-serial per SMPTE 259M. Supports 525L@29.97Hz frame rate and 625L@25Hz frame rate.
Impedance	75 Ω
EDH Support	None
Embedded Audio	Embedding of AES3 streams for both audio ports 1 and 2 per SMPTE 272M. Audio content, in digital format, follows that of the associated port. Full user control of first 3 bytes of the C (Channel Status) bits for each channel.
GENLOCK (OPTION)	
Genlock Reference Input	Composite video reference at 1 V_{p-p}
Genlock Reference Format	NTSC composite per SMPTE 170M PAL (B, G, H, I) composite per CCIR 624
Genlock Reference Termination	Hi-Z on BNC coax jack
Genlock Lock Time (w/50 ppm initial timing error)	<2 seconds
Genlock Unit-to-Unit Timing Variation	Units may be aligned using internal adjustments: Video output timing may be adjusted in 2.3 nS (1/16th of 27MHz clock period) increments. Adjustment range is ±9.0µsec minimum. Composite video subcarrier phase may be adjusted in ~1.4° phase increments. Full range is ±180°.

Table 1: Technical Specifications

Characteristic	Specification
TEST MODES	
Audio/Video	Port 1&2 audio test tones: pulsing 1 kHz tone @ ~ PPL -10dB Video test pattern: 75% Color bars (on composite video only) *Signals are for system connection verification and are not useful for measurements.*
RF Ports (if RF switch installed)	Sampling of all RF input ports for RF power level
Relays	Toggles selected relay (Cue or Alarm) on continuing basis
FRONT-PANEL MONITORS	(actively-isolated from, but otherwise buffered copies of the standard analog outputs)
Video	Composite video; 1 V_{p-p}, 75 Ω
Audio	One stereo pair (user-selectable from audio port 1 or 2), Level: ~ -19 dB below main audio output (if set for +24 dBu output PPL) Impedance: < 60 Ω, unbalanced
SERIAL PORTS	
Standard	RS232, DCE
Handshaking	None in standard configuration. May be upgraded for 5-wire interface (RTS/CTS) - contact factory.
Selectable Services	Terminal monitoring and control Modem dial-in Auxiliary async data output COMPEL® E-mail character-based async output Local COMPEL control input (testing only)
Baud Rates	Up to 38.4 kilobaud
Formatting	8 data bits, one start, one stop-bit, half-duplex. Parity selection set by unit software.
Daisy Chaining	May be upgraded for shared serial bus. Serial ports with "Terminal" or "Modem" device assignments may be daisy-chained using tri-state of data output lines.
ETHERNET PORT	
Physical Layer	Autoselection of 10baseT or 100baseT on RJ45 jack
Media Access and Link Layers	Per IEEE 802.3 (Ethernet)
Network and Transport Layers	Binds to TCP/IP stack which enables (1)Web-based control; (2)Telnet control; or (3)IP Data routing (output)

Table 1: Technical Specifications

Characteristic	Specification
ALARM/CUEING RELAYS	One relay dedicated to indicate unit ALARMS and two relays dedicated to user control (such as cueing). The ALARM relay automatically de-energizes for alarm conditions so that power loss to the unit indicates as an alarm.
Type	Form C, wiper contacts NC contact when de-energized and NO contact when energized
Polarity	Common, NC and NO contacts supplied externally
Rating	30VDC open circuit, 100 mA max current closed
FRONT-PANEL EMAIL	Up to 512-character messages from COMPEL®. New messages over-write older messages. May also be cleared by local user.
CHASSIS	
Height	Std. 1RU 1.75 inches (4.45cm)
Width	EIA std. 19 inches (48.26cm)
Depth	Back of rack-ears to rear panel: 14.9 inches (37.85 cm) Back of rack-ears to end of connectors: 15.7 inches (39.88 cm)
Weight	~10.5 lb. (with Receiver card & AV monitor option only)
Cooling	Fan-cooled with left-side inlet and right-side exhaust (viewed from front). Fan is activated after unit reaches specific temperature.
ENVIROMENTAL	
Operating Temperature	+10°C to +50°C (+50°F to +122°F) Unit gives warning indication for over-temperature conditions
Storage Temperature	-20°C to +70°C (-4°F to 158°F)
AGENCY APPROVALS	
UL	UL/C-UL1950 3rd Edition
FCC	Part 15B Class A, per Title 47 CFR (FCC rules)
CE	EN60950, EN55022(94), and EN55082-1 —tested per EN61000-4-2(95), -4-3(02), -4-4(95), -4-5(95), -4-6(96), and –4-11(94)

Table 2: Transport In Options

Characteristic	Specification
DVB-QPSK RECEIVER OPTION (No RF Switch)	
RF INPUT	
Input Impedance	75Ω unbalanced
Input VSWR, 75-Ω system	< 2.1:1 (9.0 dB R.L. min), 950-1450 MHz < 3.0:1 (6.0 dB R.L. min), 1450-2150 MHz
Surge Resistance	Guaranteed survival from up to 10 direct-coupled 8kV discharges (per IEC 801-2)
RF TUNING	
Input Frequency Range	950 to 2150 MHz
LO Leakage at Input	≤ -50 dBm
Symbol-rate Range	2 to 45 Msps (may be limited by Transport Rate limits)
Tuning Resolution	10 kHz
Input Signal Level Range	-25 to -65 dBm
Signal Level Warning Limits	warns within +10/-5 dB of upper limit and +5/-10 dB of lower limit
Maximum Aggregate Input Power	-5 dBm min
DEMODULATOR/FEC	
Modulation	QPSK (α =.35) per DVB (EN 300 421)
Carrier acquisition range	±1 MHz or ± 10% of symbol-rate QPSK, whichever is greater
Max E_b/N_0 @ Quasi-error-free threshold (less than one uncorrected error-event per hour)	Per EN300 421: QPSK R=1/2: 4.5 dB, QPSK R=2/3: 5.0 dB, QPSK R=3/4: 5.5 dB, QPSK R=5/6: 6.0 dB, QPSK R=7/8: 6.4 dB
RF Power Level Estimator (locked to carriers or not)	Unitless metric SIGNAL corresponds to input power as follows: above -25dBm Extrapolated from 90 up to 100+ -25dBm 90 -35dBm 70 -45dBm 50 -55dBm 30 -65dBm 10 below -65dBm Extrapolate from 10 down to <0 no signal <0 Accuracy: unit to unit <±5 dBm; over frequency <±10 dBm

Table 2: Transport In Options

Characteristic	Specification
LNB DC POWER	(supplied on RF center conductor)
Activation	User- or network-controlled selectable: ON or OFF
Voltage	~ +18.7 VDC nominal at no loading, +18.0 VDC min. at max loading
Current (full load)	350 mA max
Short-circuit protection	Thermal fuse, tripping at ~500 mA.
European "Universal LNB"	Software may be upgraded for "Universal Single LNB" polarization and freq-band control per ASTRA recommendation
DVB-QPSK RECEIVER WITH 4-PORT RF SWITCH OPTION	
SWITCHED RF INPUTS	
Input Impedance	75Ω unbalanced
Isolation, port-to-port	> 45 dB, 950-1450 MHz > 40 dB, 1450-2150 MHz
Input VSWR, 75-Ω system, selected port	< 2.6:1 (7 dB R.L. min), 950-1450 MHz Not guaranteed, 1450-2150 MHz
Input VSWR, 75-Ω system, unselected port	< 2.0:1 (10 dB R.L min), 950-1450 MHz Not guaranteed, 1450-2150 MHz
Surge Resistance	Guaranteed survival from up to 10 direct-coupled 8kV discharges (per IEC 801-2) whether port is selected or not
RF TUNING	Same as QPSK option described above
DEMODULATOR/FEC	Same as QPSK option described above
LNB DC POWER	Supplied on separate 2-pin header. Performance otherwise the same as QPSK option described above
TURBO PSK RECEIVER OPTION, BROADCOM PROTOCOL	
RF INPUT	
Input Impedance	75Ω unbalanced
Input VSWR, 75-Ω system	< 1.9:1 (10 dB R.L. min), 950-1450 MHz < 1.9:1 (10 dB R.L. min), 1450-2150 MHz
Surge Resistance	Guaranteed survival from up to 10 direct-coupled 8kV discharges (per IEC 801-2)

Table 2: Transport In Options

Characteristic	Specification
RF TUNING	
Input Frequency Range	950 to 2150 MHz
LO Leakage at Input	≤ -60 dBm
Symbol-rate Range	1 to 30 Msps (may be limited by Transport Rate limits)
Tuning Resolution	10 kHz
Input Signal Level Range	-25 to -65 dBm
Signal Level Warning Limits	warns within +10/-5 dB of upper limit and +5/-10 dB of lower limit
Maximum Aggregate Input Power	0 dBm max
DEMODULATOR/FEC	
Modulation	1. DVB-QPSK (α =.35) per EN 300 421 2. Advanced "Turbo-QPSK" (α =.20 default; R=½, ¾) per Broadcom proprietary protocol 3. Advanced "Turbo-8PSK" (α =.20 default; R=2/3, 5/6, 8/9) per Broadcom proprietary protocol. [R=¾ Type I and II - contact factory] 4. Advanced "Turbo-16QAM" (α =.20 default; R=¾) per Broadcom proprietary protocol
Carrier acquisition range	±1 MHz or ± 10% of symbol-rate QPSK, whichever is greater

Table 2: Transport In Options

Characteristic	Specification
Max E_b/N_0 @ Quasi-error-free threshold (less than one uncorrected error-event per hour)	1. DVB-QPSK QPSK R=1/2: 4.5 dB, QPSK R=2/3: 5.0 dB, QPSK R=3/4: 5.5 dB, QPSK R=5/6: 6.0 dB, QPSK R=7/8: 6.4 dB 2. Turbo-QPSK R=1/2: 2.4, R=3/4: 3.6 3. Turbo-8PSK R=2/3: 4.8 dB, R=3/4(I): 5.4, R=3/4(II): 5.8, R=5/6: 6.8, R=8/9: 8.2 4. Turbo-16QAM R=3/4: 6.6 dB
RF Power Level Estimator (locked to carriers or not)	Unitless metric SIGNAL corresponds to input power as follows: above -25dBm Extrapolated from 90 up to 100+ -25dBm 90 -35dBm 70 -45dBm 50 -55dBm 30 -65dBm 10 below -65dBm Extrapolate from 10 down to <0 no signal <0 Accuracy: unit to unit <±5 dBm; over frequency <±10 dBm
LNB DC POWER	(supplied on RF center conductor)
Activation	User- or network-controlled selectable: ON or OFF
Voltage	~ +18.7 VDC nominal at no loading, +18.0 VDC min. at max loading
Current (full load)	350 mA max
Short-circuit protection	Thermal fuse, tripping at ~500 mA.
European "Universal LNB"	Software may be upgraded for "Universal Single LNB" polarization and freq-band control per ASTRA recommendation

Table 2: Transport In Options

Characteristic	Specification
TURBO PSK RECEIVER WITH 4-PORT SWITCH OPTION	
RF SWITCH INPUT	4-port, single-throw switch
Input Impedance	75Ω unbalanced
Isolation, port-to-port	> 45 dB, 950-1450 MHz > 40 dB, 1450-2150 MHz
Input VSWR, 75-Ω system, selected port	< 1.9:1 (10 dB R.L. min), 950-1450 MHz < 1.9:1 (10 dB R.L. min), 1450-2150 MHz
Input VSWR, 75-Ω system, unselected port	< 1.9:1 (10 dB R.L. min), 950-1450 MHz < 1.9:1 (10 dB R.L. min), 1450-2150 MHz
Surge Resistance	Guaranteed survival from up to 10 direct-coupled 8kV discharges (per IEC 801-2) whether or not port is selected
RF TUNING	Same as Turbo PSK option described above
DEMODULATOR/FEC	Same as Turbo PSK option described above
LNB DC POWER	Supplied on RF Input Port 4 - otherwise performs the same as the Turbo PSK receiver described above.
ASI TRANSPORT INPUT OPTION	
DVB-ASI INPUT	One input per DVB ASI per EN50083-9 Annex B
Physical layer	270 Mbaud signaling on 75Ω coax cable
Minimum byte gaps	Down to 0-byte interbyte gaps
Transport data rate	Limited to rates allowed by parent IRD

1.4 Safety Summary

The U4650 is designed for safe use with few special precautions required of the user. The following items are basic precautions to use when installing and working with your U4650:

Do not open the U4650 chassis cover.

The U4650 incorporates security labels over some of the screws. There are no user-serviceable components within the U4650. Tampering with these security labels or opening the unit will void your warranty. If you have questions, contact Wegener's Customer Service Department at the address or numbers listed in **Chapter 5 Customer Service** on page 83.

1.5 Glossary of Terms and Abbreviations

Table 3: Glossary of Terms

Term	Definition
Ad avail, digital	The opportunity for a local program splicer to insert local content in the MPEG PES streams in substitution for “regular” network-distributed programming. The avail is bounded by “splice out” and “splice in” points. "Splice points" are seamless insertion points (located for the splicer by DPI messages) where the compressed stream may be broken and substituted without frame-by-frame interruption of video.
Ad avail, analog	The opportunity for local users to switch from the network-supplied programming to locally-generated content (commercials). This is signaled by use of DTMF tones or closures of cue relays.
Alarm	A condition or notification of a condition that prevents proper U4650 functioning.
Application Software	The main host software which sets up the unit hardware, runs the process of acquiring transport stream sources, sets up and monitors the demux and decompression processes, monitors unit operations, and interfaces with the network and local users.
ASI (or DVB-ASI)	An “asynchronous” bit-serial physical interface for transport streams. Transmitting and receiving functions are designed such that the time relationships between all packets and their timing references are unchanged.
Aspect ratio (of video)	The ratio of horizontal to vertical width in the expected video presentation monitor.

Table 3: Glossary of Terms

Term	Definition
Audio Language Descriptor	Legacy 3-character MPEG descriptor applied to a program's audio streams. It was originally allocated to designate languages, but is now used for generic identification.
Automated Recovery (or Recovery)	The mechanism used when the U4650 is unable to acquire a valid transport stream, loses network control or detects an invalid control stream, or is unable to deliver the required services using its current settings. The unit automatically begins attempting operations under "backup" unit settings stored in the presets table until it can return to normal operation or is stopped by local user command.
Boot loader	Software residing in non-writable zone of flash which executes at unit reset. It will verify and load the preselected application.
CA	See "Conditional Access".
COMPEL®	Wegener's network control software that may be used to manage your U4650 as well as other hardware.
Conditional Access	Wegener's system for securing the transmitted transport stream from unauthorized access. It features distribution of ciphered authorizing messages within a special PID. Upon deciphering in secure processors within the IRD, these messages continuously update the IRD with the current descrambling key.
DPI	Digital Program Insert. A special message, borne in an MPEG PID associated with a particular program, that signals the boundaries of ad avails.
DTMF	Dual-Tone Multi-Frequency. Tone signaling system used by the legacy telephone system. Tone pairs represented each of the keyboard items 0-9, *, and #. This system may be used to control external cueing equipment.
DVB	Digital Video Broadcast working group. This is a shorthand designation for a group of industry standards that provide enhancements in the use of MPEG transport streams. (For example, one DVB standard defined the standard way QPSK-modulated carriers would convey these streams over satellite world-wide.)
E_b/N_0	Energy-per-bit per Noise density-per-Hertz. This is a unitless ratio that expresses signal-to-noise ratio in carrier transmission systems that convey digital data. A quality measurement for any such system is the E_b/N_0 needed to just convey the digital data within acceptable error rates. This is called the "E_b/N_0 threshold".
Errored seconds	see ERT.
ERT	Error Rate Threshold. Per DVB, that input RF signal-to-noise ratio, expressed as "E_b/N_0", where the receiver card detects an average of one transport packet with uncorrected errors per one-hour interval. Wegener defines a similar metric of an average of one errored second per hour, where an "errored second" is any one-second interval in which one or more transport packets contains uncorrected errors.
Ethernet	The widely-used LAN technology specified by IEEE standard 802.3

Table 3: Glossary of Terms

Term	Definition
Extended windows	Where decompression of 4:2:2 chroma sampled MPEG video is supported, the original encoder may be set to compress Vertical Blanking Interval (VBI) data in the same manner as the video in the active picture area. This mode where extra vertical resolution is supplied, is called Extended Windows by Wegener. The term Standard Windows designates systems where only the active picture area is compressed and the VBI must be transported by some other method.
Fade	Generic term used to describe loss of RF carrier and subsequent loss of transport stream. The loss of the carrier is inferred when carrier tracking in the receiver card ceases. If the transport input comes from a terrestrial interface (e.g. ASI), the loss of the transport is still termed a fade. Fade is also assumed if either (1) the errored second rate or (2) the continuity count rate exceeds alarm thresholds.
Flash memory	A type of non-volatile memory characterized by block erasures, special block writing techniques, and random-access reads. Generally, semi-permanent objects such as application software code are stored to flash. However, because the reads are slow relative to standard SDRAM, the software must be relocated to SDRAM before execution.
Genlock	The process of aligning the presentation timing of the IRD's video output to the timing reference in the station plant. This allows for seamless switching between the IRD's video output and other "genlocked" videos.
Ghost PID	PIDs which do not convey well-known ISO/DVB/ATSC tables and which are not referenced by any program's PMT.
IRD	Integrated Receiver-Decoder. A product which features a "receiver" to extract transport streams from satellite-borne carriers and a companion "decoder" to decompress MPEG elementary streams (from within said transport streams) in order to recreate the original audio/video/data signals. The Unity 4650 is an IRD.
Keep-alives (COMPEL)	Simple COMPEL network messages, addressed to "all", bearing date and time.These are transmitted regularly (every 5 seconds, for example) so that IRDs may quickly and continuously verify their network connection.
KMS	Key Management System. The sub-system within the Wegener Conditional Access system that creates and ciphers the scrambling keys and then distributes them to the uplink UMX5010 and all downlinked IRDs conveyed in a special PID within the transport stream.
LAN	Local area network. Your U4650 may be connected to an Ethernet LAN.
LCD	Liquid crystal display. The front-panel screen on your U4650 is a liquid crystal display.
LED	Light-emitting diode. The front-panel indicator lights on your U4650 are LEDs
Mbps, kbps or Msps	Units of data transport rate - Megabits per second (1 million bits per second), kilobits per second (1 thousand bits per second), or million symbols per second (1 million symbols per second)
MPEG	Moving Picture Experts Group - refers to the method of video compression established by this group. (The Unity 4650 utilizes the MPEG2 format for video.)

Table 3: Glossary of Terms

Term	Definition
Network Protection Mode	A non-volatile setup parameter whose value is "Shared" or "Protected" (or "not Shared"). Similarly, each network control stream has a "Share" status field as part of the COMPEL packet framing. A network control stream is considered "invalid" to the U4650 if the network ID in the stream differs from that of the IRD and if either the network stream or the U4650 are set to be "Protected". For test purposes only, there is a generic network ID that the COMPEL system may transmit which is always considered to be "valid" by all IRDs.
Non-volatile	Any memory object (such as a configuration parameter) which holds its value through power cycles and resets. This is in contrast to volatile memory objects which are lost through power cycles and (usually) resets.
NTSC	National Television System Committee. The composite color video standard used domestically (and in a few countries outside US) based on 525-line 59.97 Hz field rate (with 2:1 interlace).
NVRAM	Non-volatile RAM. A random-access memory (RAM) that retains it's value through power outages (or is non-volatile). Key IRD operating parameters are stored to this type of memory and may be individually accessed for reading or writing.
PAL	Phase-Alternating-Line. A set of composite color video standards used worldwide (outside US) which implements a line-by-line reversal of phase of one of the orthogonal color components. For our use, all PAL signals are assumed to be 625-line 50 Hz field-rate systems with varying chroma and luma bandwidths and color subcarrier frequencies.
PAT	Program Allocation Table. A PSI table within an MPEG transport stream which cross-references all available programs to a PID for its PMT. This table is always present in legal transport streams and must always be in the clear (not scrambled) even when Conditional Access scrambling is used.
PCR	Program Clock Reference. A time-base signal used to synchronize the IRDs internal timing to the same timing in the MPEG encoder for the received program. Multiple programs may share a PCR, depending on the multiplexer used to create the final transport stream.
PES Stream	Packetized Elementary Stream. The MPEG designation for a compressed component of a Program (such as audio or video) which includes the timing information necessary for synchronization (e.g. - synchronizing audio to video).
PID (or Packet ID)	The unique transport stream packet identifier assigned to each constituent data stream within the transport stream. Also, in this document, "PID" is used to designate the stream itself.
PMT	Program Map Table. A PSI table within an MPEG transport stream which cross-references a program (or programs) against all the PIDs that bear its component streams (such as audios, video, DPI, PCR, etc.). IRDs need this table to decode the compressed components of that program.
Presets Table	A non-volatile table of unit presets. This table is used for either automatic recoveries or as a shorthand method to quickly reconfigure the unit. The presets table may be programmed at the factory and edited by the customer, either locally or via network control.
Program	A single media stream (combination of audio, video, data, etc.) tied to a common time base.

Table 3: Glossary of Terms

Term	Definition
Program Number	A numerical code representing a program.
PSI Tables	A group of information-bearing tables, each borne by well-known PIDs, regularly transmitted in the transport stream. See also "PAT" and "PMT". Also, ISO 13818-1 gives a thorough description of these and other Tables.
PTS	Presentation Time Stamp. A marker signal associated with audio and video streams within a program conveyed in MPEG transport stream. This signal allows the audio and video to be presented in synchronism to each other.
RAM	Random access memory. A general term for all volatile memory types out of which application software executes and into which its variables, state information, and messages are stored. RAM is also used to designate the volatile storage used by the Transport Demux and decompression devices.
RF	Radio frequency
SDI	Serial Digital Video. An interface for transmission of uncompressed video in digital form on coaxial cabling. (Within this signal, two stereo pairs of AES3 digital audio may also be conveyed - also called "embedded audio".)
Service Descriptor	Service Descriptors are text entries in the Service Descriptor table (SDT, defined per a DVB standard). Service Descriptors are used to give text names to the Programs within transport streams.
Service settings	That part of the Unit Settings which allow for the local detection, decompression, and output (or "display") of a program's services.
Setting, Last Commanded	The most recent Unit Setting requested by a user (local or network) command. This value is non-volatile.
Setting, Last Successful	The most recent Unit Setting, which is NOT a Temporary Setting, at which the IRD was able to deliver services while free of alarms. This may also be the Last Commanded setting or it may be the attempted (Transient) setting at which auto-recovery was successful. This value is non-volatile.
Setting, Permanent	That non-volatile Unit Setting which the IRD will attempt, if in Normal Operation, after a unit reset. This will be the Last Commanded setting unless, since that command was issued, the IRD had executed an Auto-Recovery and successfully acquired at one of the Preset settings. In other words, the Permanent Setting is the most recent of the Last Commanded and Last Successful Settings.
Setting, Temporary	A special volatile unit setting with a timed expiration period. The command to invoke this special setting and the subsequent success of the IRD to find services at this setting does not affect the non-volatile value of the Last Commanded or Last Successful Settings.
Setting, Transient	A volatile Unit Setting used for immediate acquisition of services. Transient settings are either Temporary settings (see above) or Presets used for attempted acquisition during Auto-Recovery. If, in the case of Presets, the attempt is successful, those settings become Permanent Settings.
T_{MRA}	Maximum Recommended Ambient Temperature, the highest operating temperature for which the unit is rated

Table 3: Glossary of Terms

Term	Definition
Transport Loss, Signal Loss, or Carrier Loss	Loss of transport stream, usually because of carrier-tracking loss, for a time period defined by a non-volatile factory setting. Transport stream can only be "lost" if the IRD has first passed the "Verified Transport" state at a particular carrier setting with no intervening change to carrier settings because of user (local or network) command or Automated Recovery.
Transport Rate	The data bit-rate of the transport stream, including the packet sync byte.
Transport Settings	The unit settings which allow for the detection, demodulation, and synchronization to a transport stream (e.g. carrier settings such as frequency, data-rate, FEC, modulation as a group).
Transport Stream (or MPEG Transport Stream)	A multiplex of several data streams, each of which is borne in transport packets, 188-byte blocks containing a sync word, header information (including a PID), and payload data. This multiplex includes PSI data tables, programs, padding, and floating PIDs such as those used by COMPEL® network control.
Unit Setting	That set of user-programmed, non-volatile IRD attributes which identifies: (1) the intended transport stream source (e.g. RF carrier parameters, ASI port, etc.); (2) the desired service information (e.g. selected program, audio stream selection, etc.); and (3) any supporting monitor settings (e.g. RF carrier margin warning zone, etc.). These attributes are generally programmed as a set, whether from user command or by retrieval from a Preset entry during Automated Recovery. When the term "unit setting" is used, it usually denotes the currently active unit setting.
Volatile	See Non-volatile (inverse of).
Warning	A condition or notification of (1) a condition that may compromise the proper performance of your U4650; or (2) any non-alarm condition that should be brought to local user's attention.

Chapter 2 Installation

This chapter provides instructions on unpacking, mounting, and connecting your U4650 as well as connector information including detailed pinouts.

2.1 Unpacking and Inspection

Carefully unpack the unit and its ac power cord and inspect for obvious signs of physical damage that might have occurred during shipment. Any damage claims must be reported to the carrier immediately. Be sure to check the package contents carefully for important documents and materials.

NOTE: Please save the packing materials and original shipping containers in case you must later return the unit for repair. Packing these units in other containers in such a way that they are damaged will void your warranty.

2.2 Location and Mounting

The U4650 may be mounted in a standard 19-inch equipment rack or set up for desktop operation. In either location, maintain a clean, dry environment for your U4650.

FCC-mandated suppression of radiated emissions

If the Ethernet port has a cable connected to it, that cable MUST be properly shielded and grounded. This must be done to minimize RF emissions which could interfere with nearby equipment.

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference for which the user may need to take mitigating action.

DANGER

To avoid damage to this and other equipment, or personal injury, the following items should be strictly observed.

Elevated Operating Ambient

When equipment is installed in a closed or multi-unit rack assembly, the operating ambient of the rack environment may be greater than the room ambient. Therefore, consideration should be given to the ambient air temperature within the rack, and not just inside the room, when deciding if the maximum recommended ambient operating temperature (T_{MRA}) is being met.

Reduced Air Flow

Equipment should be installed such that airflow required for safe operation of the equipment is not compromised. The U4650 may be arranged in a rack without empty spaces between units if heat rise is prevented by ensuring its side vents remain unblocked with adequate clearance around the vent holes.

Mechanical Loading

Mounting of the equipment in a rack should be such that a hazardous condition is not produced by uneven loading. This unit is not very heavy, but total rack loading must be considered. Also, do not rest any unsupported equipment on your U4650.

Circuit Overloading

Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits could have on overcurrent protection and supply wiring. Ensure that the total rack or breaker power consumption does not exceed the limits of the AC branch circuit. Appropriate consideration of equipment ratings should be used when addressing this concern.

Reliable Earthing

Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (use of power strips, chassis ground lugs, etc.).

Rack Mounting

Your U4650 is sized at a single RU and will fit an EIA-standard, 19-inch-wide equipment rack.

a) First install angle brackets or cross-supports capable of supporting both the unit and its connecting cables. Screw or bolt the supports securely to the equipment rack.

b) Place the U4650 on its supports and use four anchor screws or bolts and nuts to secure the U4650 front brackets to the rack.

WARNING

The front brackets must be secured to the rack. If front brackets are left unsecured, the unit may shift forward and fall from the rack during installation or operation. Failure to secure the front brackets may result in personal injury and/or damage to the equipment.

Desktop Installation

To set up the U4650 in a desktop environment, place the U4650 on a flat surface where it will not be subject to spills or impacts. Also route cables to the unit so that they will not be hit or pulled causing damage to the connectors or to the unit itself. Ensure a sufficient flow of cool air (See "Reduced Air Flow" on page 26.) so that the unit's operating ambient temperature range is not exceeded.

WARNING

Locate the U4650 and its cables to avoid impacts, spills, and pulling cables and to ensure sufficient air flow. Failure to locate the U4650 in a proper environment may result in damage to the equipment.

2.3 U4650 Connections

Figure 2.1 shows the connector locations on the U4650 rear panel.

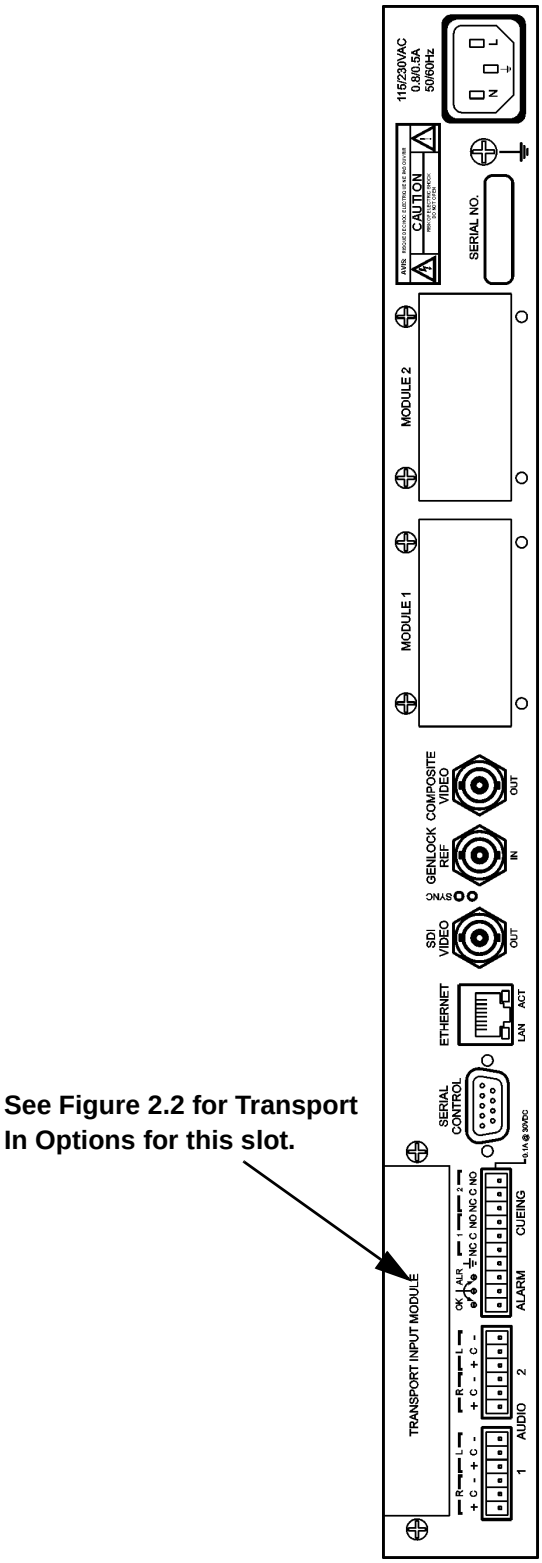

Figure 2.1 U4650 Rear-panel Connector Locations

Figure 2.2 U4650 Transport In Options below shows rear-panel views of the five available receiver modules.

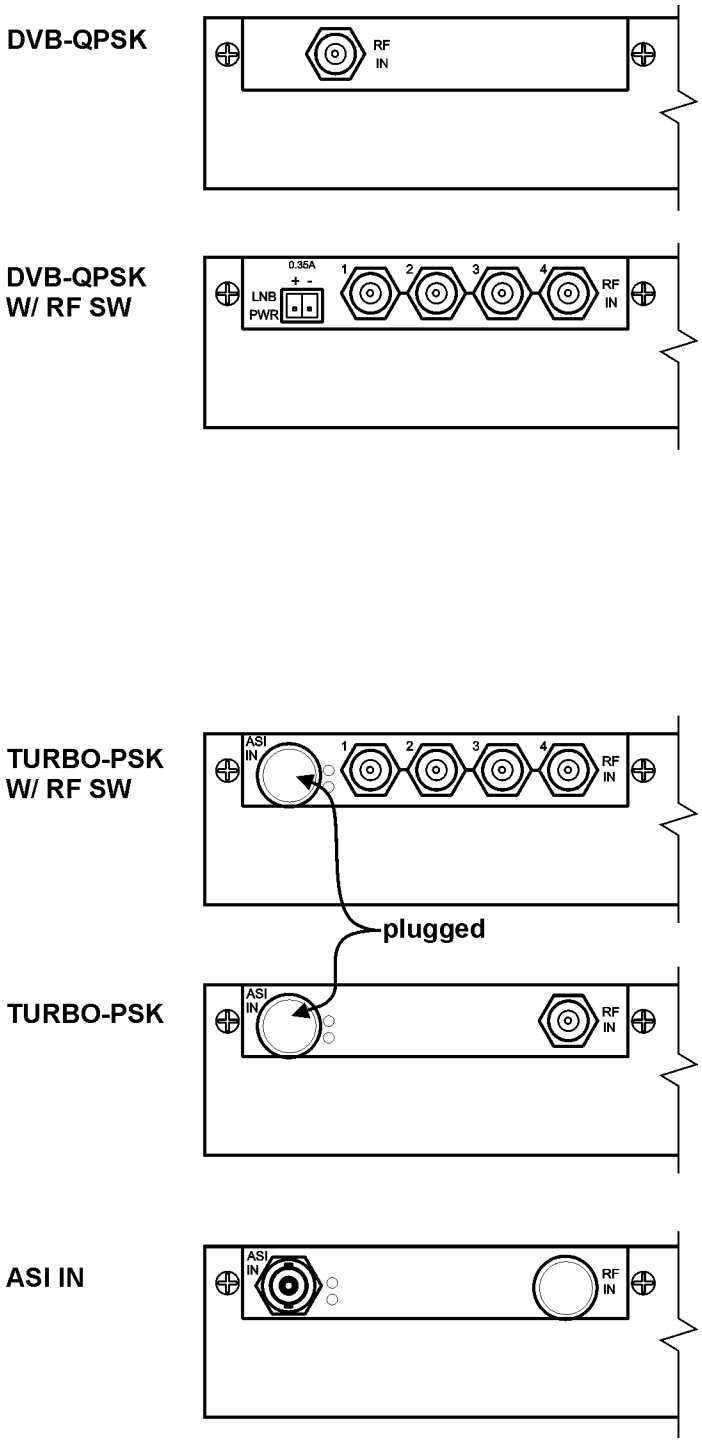

Figure 2.2 U4650 Transport In Options

Table 4: Rear-panel Connectors below lists the U4650 rear-panel connectors, their types and pinout information. See **Interpreting LEDs** on page 45 for descriptions of rear-panel indicators.

Table 4: Rear-panel Connectors

Connector Designation	Type	Pin	Signal Name
ALARM/CUEING	10-pin male header (mates to removable terminal-strip)	1 (on left as viewed from rear of unit)	OK (COM closes here when OK)
		2	COM:
		3	Alarm (COM closes here on alarm or if power is off)
		4	GND
		5	Cue Relay #1: N.C. contact
		6	Cue Relay #1: Common contact
		7	Cue Relay #1: N.O. contact
		8	Cue Relay #2: N.C. contact
		9	Cue Relay #2: Common contact
		10	Cue Relay #2: N.O. contact
AUDIO (same for both ports 1 and 2)	6-pin male header (mates to removable term strip)	1 (on left as viewed from rear of unit)	Right '+'
		2	Right GND
		3	Right '-'
		4	Left '+'
		5	Left GND
		6	Left '-'

Table 4: Rear-panel Connectors

Connector Designation	Type	Pin	Signal Name
SERIAL CONTROL	RS232, 9-pin D female jacks	1	DCD (internally pulled to +5V)
		2	RxD (data output)
		3	TxD (data input)
		4	DTR (not connected)
		5	GND
		6	DSR (internally pulled to +5V)
		7	RTS (internally pulled to +5V, may be upgraded for handshaking)
		8	CTS (asserted ON, may be upgraded for handshaking)
		9	RI (internally pulled to +5V, with weak current limiting)
ETHERNET	RJ45 Jack	1 (on left as viewed from rear of unit)	TXDO +
		2	TXDO -
		3	RXDI +
		4	Shorted together, then terminated into an AC ground.
		5	
		6	RXDI -
		7	Shorted together, then terminated into an AC ground.
		8	
SDI VIDEO OUT (only w/ Pro Option)	BNC Jack		Serial 270 Mbaud component Digital Video out (with 2 embedded AES3 digital audios)
GENLOCK REF IN (only w/ Pro Option)	BNC Jack		Genlock Reference composite video input
COMPOSITE VIDEO OUT	BNC Jack		Composite Video Out
115/230 VAC	Std. IEC Receptacle		AC line in

Table 4: Rear-panel Connectors

Connector Designation	Type	Pin	Signal Name
DVB-QPSK Transport In Option			
RF IN	Type F coax jack		L-band RF Input from external LNB (with LNB DC on center pin)
RF OUT	Type F coax jack		Loop-thru RF output
DVB-QPSK with 4-way RF Switch Transport In Option			
RF IN – 1 through 4	Type F coax jacks		4-way RF Switch Inputs (with DC block)
LNB PWR*	2-pin male header (mates to removable terminal-strip)	1 (on left as viewed from rear of unit)	LNB DC Output positive leg
		2	LNB DC Output return leg
Turbo-PSK Transport In Option			
ASI IN	<plugged>		Not used
RF IN	Type F coax jack		L-band RF Input from external LNB (with LNB DC on center pin)
Turbo-PSK with 4-way RF Switch Transport In Option			
ASI IN	<plugged>		Not used
RF IN – 1 through 3	Type F coax jacks		4-way RF Switch Inputs (with DC block)
RF IN 4	Type F coax jack		4-way RF Switch Input (with LNB DC on center pin)
ASI Transport In Option			
ASI IN	BNC Jack		DVB-ASI Input
RF IN	<plugged>		Not used
* LNB DC power may be locked to OFF by network.			

Table 4 below lists the U4650 front-panel connectors, their types and pinout information.

Table 5: Front-panel Connectors

Connector Designation	Type	Pin	Signal Name
Video Monitor	BNC jack		Composite Video monitor
Audio Monitor	¼" stereo phone jack		Stereo audio headphone monitor, selectable between audio ports 1 or 2

2.4 Serial Port Configuration

Device assignments

The U4650 has one external serial port. A "device" must be assigned once to the serial port, but no "device" may be assigned more than once. In addition, more than one device may be assigned at one time but only one device which accepts input may be assigned. (If multiple devices are assigned to the serial port, the port's settings are controlled by the device with higher priority according to the list below.) Device port assignment and device configuration (see below) may be controlled only from the unit front panel and the network may disable this capability. The possible devices are:

1. Terminal
2. Modem ("modem" being remote terminal via modem)
3. Local COMPEL®
4. Auxiliary Data
5. Printer (including COMPEL® e-mail and reports)

Device configurations

When a serial port configuration command is received, the specified configuration is immediately stored for the specified device (e.g. for the "Terminal" device). If a serial port is currently assigned another device, then its output buffer is immediately flushed and the port re-configured. Communication is fixed at 1 start, 1 stop, and 8 data bits, with no hardware handshaking. No provision for software handshaking is made in this Release. The serial port's behavior for each of its device types is described in the following table:

Table 6: Device Configurations

Device	Serial Port Behavior (Italics are Programmable, Bold are Fixed)
Terminal	Configured to **19.2k, N, 8, 1**. The unit responds to the terminal commands as described in **3.4 Operation from Local/Remote Terminal** on page 59.
Modem	Configured to *B, P,* **8, 1**. The unit responds to the commands as described in **3.4 Operation from Local/Remote Terminal** on page 59.
Aux Data	Configured to *B, P,* **8, 1**. This is an output only (all inputs ignored).
Local COMPEL	Configured to *B, P,* **8, 1**. This is an input for testing only.
Printer	Configured to *B, P,* **8, 1**. This is an output only.
The legal values for *B* are: 1200, 2400, 4800, 9600, 19.2k, or 38.4 kilobaud. The legal values for *P* are: 'O', 'E', or 'N' for Odd, Even, or No parity.	

Device handling

Terminal I/O - The Terminal device is used for command and control of the U4650. This I/O is a basic VT100-like emulation. All I/O is prompted by user-input text strings terminated in carriage-returns. The terminal, whether local or (via modem) remote, should be set to local echo ON. The unit only echoes a carriage-return/linefeed and then a '>' prompt after user entry. (But see **Serial Bus Control** below.)

Serial Bus Control - If enabled by the factory, the Unity 4650 supports "daisy-chaining" of terminal control. This involves sharing of a serial bus between two or more IRDs. The serial bus consists of both the transmit and receive serial port lines wired in parallel, connected to a serial port on all the IRDs and the terminal communication device (either a local terminal or modem).

Certain volatile operating states are defined for IRDs using this daisy-chain capability. These are Talker, Idle, and Waiting For Password. Units will transition from either Talker or Idle over to Waiting For Password when a wakeup hotkey is received from the user. Then, after the two-digit ID passcode is received, any unit matching that passcode proceeds to Talker (and switches its serial output to active), while all others proceed to Idle. While in an Idle state, a unit's serial port which is allocated as a Terminal and/or Modem device has an electrically isolated (tri-state) output and responds only to a hotkey input. When in the Talker state, the unit issues prompts and responds to commands normally. Note that these states are held only in volatile memory and that a unit reverts to the Idle state *during* and after a unit reset.

The unit ID is a non-volatile control assigned by the user. This daisy-chain capability is effectively disabled by assigning a Unit ID of '00'. This leaves an IRD continuously in the normal Talker state even through unit resets.

Modem I/O - The Modem device operates in a similar manner to the Terminal device. Whereas the Terminal device was limited to a specific configuration, the modem device may be set to one of several. The Modem device does not use special handshaking or special control characters, and only supports auto-answer modems. To access the modem command interface, the serial-port device must first be set to Modem. The "Terminal/IO" discussion above on emulation and echoing would then apply. The user would send the unit a carriage return and then the unit would return a prompt to enter the "modem password". If the correct password is entered, then modem access is enabled. Upon enabling modem access, the U4650 will output a welcome banner. After that, I/O is indistinguishable from normal terminal access, with the same restriction on local user access as set by the Network. Modem access is disabled when either (1) a new input serial-port device is selected, (2) when there is no user input for 10 minutes, (3) the OH command is received, or (4) the unit is reset.

Aux Data - The Aux Data device is defined to allow for async data streams to be carried within the transport stream and their raw payload output on an IRD serial port. The PID of these streams may or may not be assigned to a program number within a PMT. To recover the data, the IRD need only be given the PID and baud rate. The range of legal PIDs is established by the ISO 13818 standard as 20 to 1ffe (hex). This may be performed either by COMPEL® command or by the local user (if local control is enabled).

COMPEL® - This device is defined to allow for input of the COMPEL control stream (for testing only). There is no output.

PRINTER OUTPUT - This is an output-only device. For the Printer device, there are three legal types: COMPEL-requested Reports, COMPEL E-mail, and Raw COMPEL (binary) Data. The first output type are IRD status reports identical to those that the local user may request. These are always available for the Printer device. The second output type must be enabled by a non-volatile control. The last type, Raw COMPEL, must also be enabled by a non-volatile control (actually a factory setting that can only be modified with debug access). It is exclusive of the other outputs (the others are not allowed if dumping Raw COMPEL). For this type, the COMPEL data stream, while being processed normally by the IRD host processor, is also output as-is to the Printer device. This data is binary and includes non-printing characters.

2.5 Installation Testing

The U4650 has a number of installation tests that may be performed from the front panel. From the Home screen, press the right arrow until the Installation Testing screen is displayed.

RF input check

This test is used to verify an RF connection to a properly functioning LNB at any RF port. Perform the check as follows:

a) Press **ENT** from the Installation Testing screen to bring up the RF Input Check screen.

b) Press **ENT** again to display the input level estimate at RF Port 1. This will be an average of the estimated levels at each of the twenty-four domestic transponder center frequencies.

c) Press the right-arrow button repeatedly to display the input levels at RF Ports 2, 3, and 4 as well.

d) Press **ESC** to return to the RF Input Check screen.

Audio/video check

This test puts out a video test pattern and audio test tones to allow verification of video and audio connections. The video pattern is vertical color bars. On Port 1, the audio is a slowly pulsing (triangle-wave) tone with a higher frequency on Right than on Left. On Port 2, the audio is a slowly pulsing (sine-wave) tone also with higher frequency on Right than on Left. Use the following steps to enable or disable this audio/video test mode:

a) From the RF Input Check screen, press the right-arrow button to bring up the Audio/Video Check screen.

b) The Audio/Video Check screen will indicate that the test mode is either "Enabled" or "Disabled".

c) Press **ENT** to switch the test mode between "Enabled" and "Disabled".

d) Press the left-arrow button to return to the RF Input Check screen or **ESC** to return to the Installation Testing screen.

Relay Pulse Check

This test may be used to verify connections to the alarm or cue relays. Each relay, as it is tested, will energize and de-energize about once per second. Use the following steps to check these connections:

a) From the Audio/Video Check screen, press the right-arrow button to display the Relay Pulse Check screen.

b) Press **ENT** to display the Relay 1 Check screen.

c) The Relay Check screen will indicate that the relay is On or Off as it switches on and off about once per second. At the same time, a user should see the ohm-meter reading between the output contacts alternate between zero and (virtually) infinite.

d) Press the right-arrow button to test the remaining cue relays and the alarm relay.

e) Press **ESC** to return to the Relay Check screen.

Chapter 3 Operation

This chapter provides an overview of Unity 4650 operation, details of controls and indicators, the alarm/warning system, and user interface details.

3.1 Theory of Operation

Functional summary

If an L-band receiver card is installed, the Unity 4650 accepts carriers in that band from an external antenna LNB and then demodulates and extracts the transmitted MPEG transport stream. If an ASI transport card is installed, the U4650 accepts ASI transport from a terrestrial source and likewise extracts the transmitted MPEG transport stream. In either case, if the stream is scrambled and the unit is properly authorized, it applies the descrambling algorithm to regenerate that stream as it appeared at the multiplexer in the uplink compression system. The U4650 then decompresses the components of a selected program and provides the audio, video, and/or data services for output. In addition, the U4650 may also supply high-speed routing of IP data (sent through the satellite link) to a connected LAN.

If the Pro Option is installed, the U4650 can accept a composite video input as a timing reference and align its output video frames to that reference. This process is called genlock. In addition to genlock, the Pro Option provides the unit's video and both audios (ports 1 and 2) encapsulated in digital format as a single output on a coaxial jack. This is the unit's SDI output.

As needed, the U4650 also provides auxiliary functions such as re-insertion of vertical blanking interval data (e.g. closed captioning) in the video outputs (both analog and digital). **Figure 3.1** presents a logical block diagram of U4650 operation.

Available logical outputs from the U4650 include:

- Analog composite video decompressed from selected program (rear and optional front monitor)
- Digital video decompressed from same on optional SDI output
- Two independent balanced stereo pairs, ports 1 and 2 audios, decompressed from two selected audio streams within same selected program (rear and optional front monitor)
- Two digital audio channels decompressed from same, embedded within optional SDI output signal
- Re-insertion of VBI data from various proprietary and ATSC protocols into all video outputs, analog and digital
- High-speed IP data routing output to Ethernet LAN
- Two network-controlled cueing relays
- Alarm relay
- LNB DC power
- Auxiliary serial data

Automated recovery

If unable to deliver required services to predetermined standards, or if unable to detect a required network control stream (COMPEL®), the U4650 attempts to resume normal operation through a process called Automated Recovery. Referring to an internal, non-volatile list of "presets", the U4650 will attempt to restore either services or network control, depending on what caused the recovery. A "preset" is a list of unit settings, and the list of these presets is called the Preset Table. Automated Recovery will attempt to restore the unit according to each preset (one at a time) in the order in which they are listed in the table. The process continues (repeating attempts if necessary) until the unit successfully resumes normal operation or is halted by local user command. If successful with a preset, the settings in that preset become the permanent unit settings. Later, the local user (or the network, if available) may abort the results of the Automated Recovery and force the unit back to its last commanded setting.

Several user- or network-programmable objects control the Automated Recovery. In addition to the contents of the Preset Table, these objects include the Services Recovery Timeout, the Network Recovery Timeout, the Recovery Iteration Time, and the Local Control Re-enable Timeout. The first two timeouts control how long the unit will wait after loss of services or network control, respectively, before entering Automated Recovery. The Recovery Iteration Time sets the maximum time the unit will spend attempting recovery at each preset. The last is a special timeout for disaster recovery, such as loss of a satellite, where units whose local control was previously disabled by the network are re-enabled so that local users may implement more complex recovery plans.

Monitoring and control

Most routine U4650 operations can be performed over Wegener's COMPEL® Network Control System. Control is "broadcast" to individual units through a "ghost-PID" data component of the incoming transport stream. The U4650 is considered disconnected from the network at any time this special stream is not being received.

In addition to the remote COMPEL network control, three methods are provided for "local" monitoring and control of the U4650: a web browser interface (later release), a terminal interface, and a front-panel interface.

NOTE: Local control may be limited by COMPEL command.

The remainder of this chapter details these local monitor and control interfaces.

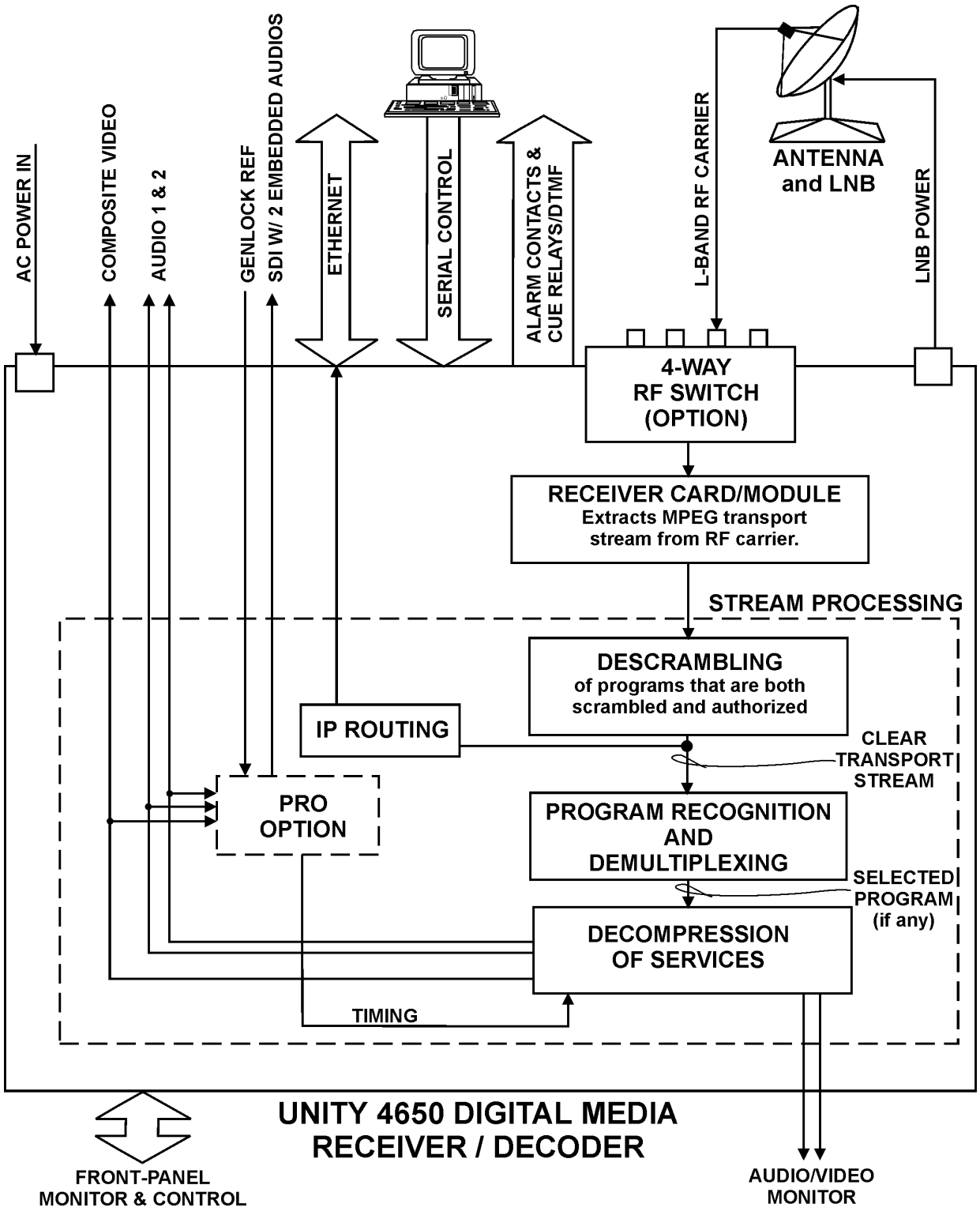

Figure 3.1 Unity 4650 Functional Block Diagram

3.2 Operation from Front Panel

Front-panel layout

The U4650 front panel (**Figure 3.2**) includes the following four main parts: a liquid crystal display (LCD), six pushbuttons, eight LED indicators, and the front-panel audio and video monitor ports. Essentially all control available through the network or terminal is also available from the front panel.

The front-panel LCD (**1**, see **LCD screen relationships** on page 41) supports unit monitoring and control by displaying screens containing status information, menu navigation pointers, and parameter input fields. Each LCD screen has a label or heading on the first row and information, parameters, or prompts on the second row which may cycle through multiple messages depending on the context.

The six pushbuttons (**2**) are your means of commanding the U4650 from the front panel. Use the four arrow buttons to navigate through menu screens and parameter selections and to scroll through available choices or characters when editing an input field. Press the **ENT** (Enter) button to select menus (downward navigation), to open editable input fields, or to commit edited parameters to the U4650. Press **ESC** (Escape) to exit an input field without saving the entry or selection. **ESC** also provides upward navigation through the menu structure to the home screen.

The eight front-panel LEDs (**3**) provide status information about your U4650 and its processes. See **Table 7: Front-panel LED Indicator Descriptions** on page 45 for complete details. (Two additional LEDs are located on the rear panel and provide Ethernet status indications.)

At far right are the video port and audio port (**4**) included for monitoring from the front panel.

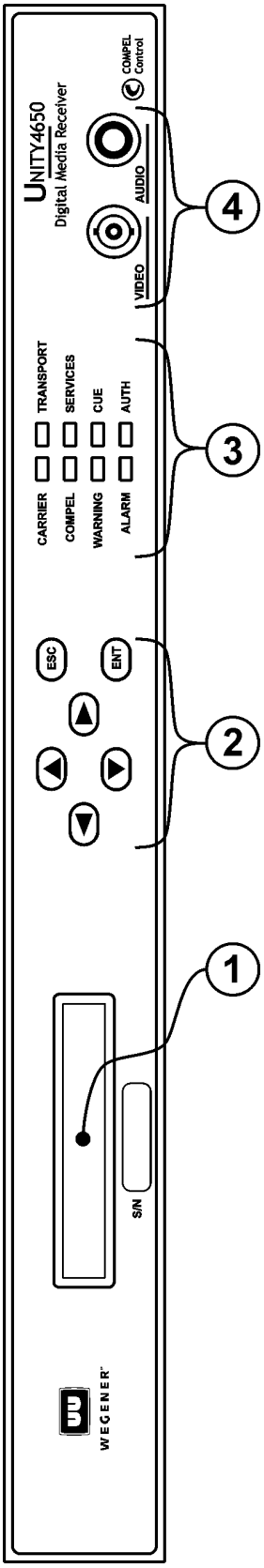

Figure 3.2 U4650 Front-panel Layout

LCD screen relationships

Figure 3.3 below shows LCD screen relationships from the top level downward. These screens are structured in two dimensions, reflecting their relationships as peers, as parents, and as children of other screens. The up-and-down dimension represents the parent-child screen relationships (navigated with the **ESC** and **ENT** buttons). The side-to-side dimension is the peer relationship (navigated with the right- and left-arrow buttons). A parent screen is usually a menu screen covering some category of U4650 operation or status. Its child screens are opened by pressing **ENT** at the parent screen. These child screens then provide access to finer details of unit monitoring and control. Multiple child screens of a parent menu screen are all peers to each other. However, the most significant set of peer screens are the top-level screens that have no parent and that include the home screen. The home screen may be reached by pressing and holding **ESC** (or pressing it repeatedly) from any other LCD screen. **Appendix A Monitoring and Control Details** gives more details on screen types and using front-panel push buttons to navigate and control the U4650.

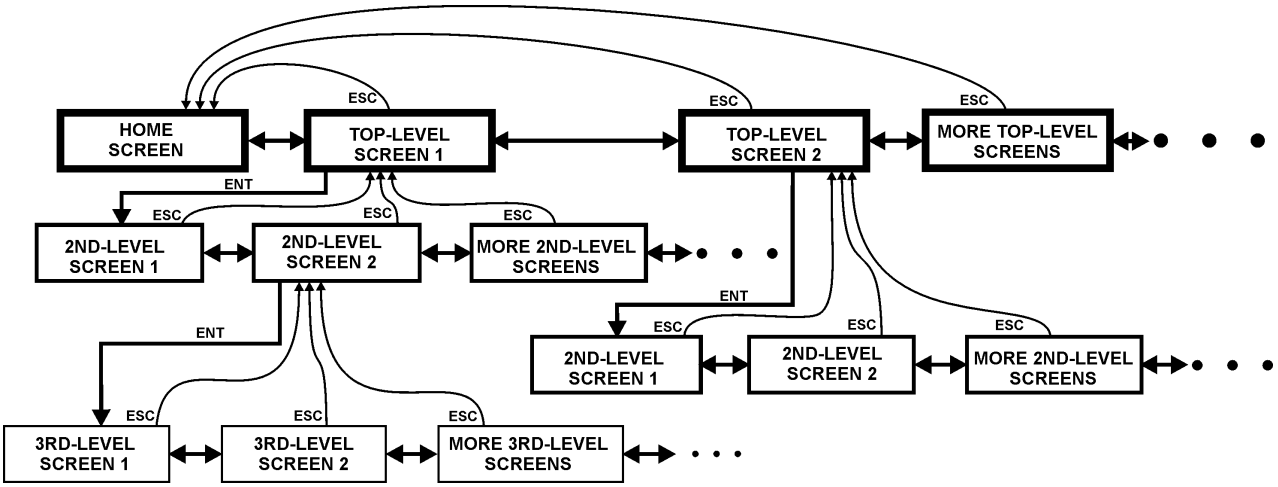

Figure 3.3 LCD Screen Relationships

LCD screen content

Available top-level screens are shown in order in **Figure 3.4 Unity 4650 Top-level Screens** on page 42. Some screens are only available under certain unit conditions or when certain optional hardware is installed. These optional screens are represented by hatched boxes. A list of the top-level screens and their functions follows:

Home Screen

Shows basic receive settings and indications about special unit conditions

Alarm/Warning Screens (when applicable)

- Shows current alarms and warnings if any
- Shows historic alarms
- Allows user to clear historic alarm indications & acknowledge/clear certain warnings

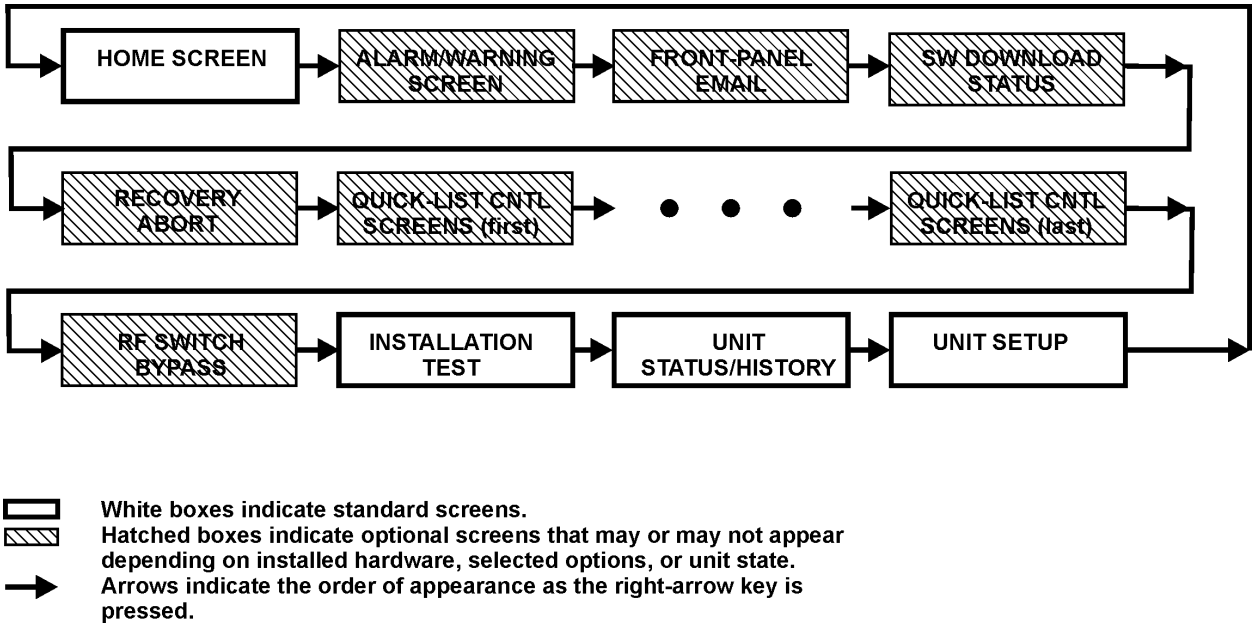
HOME SCREEN
ALARM/WARNING SCREEN
FRONT-PANEL EMAIL
SW DOWNLOAD STATUS
RECOVERY ABORT
QUICK-LIST CNTL SCREENS (first)
QUICK-LIST CNTL SCREENS (last)
RF SWITCH BYPASS
INSTALLATION TEST
UNIT STATUS/HISTORY
UNIT SETUP
White boxes indicate standard screens.
Hatched boxes indicate optional screens that may or may not appear depending on installed hardware, selected options, or unit state.
Arrows indicate the order of appearance as the right-arrow key is pressed.

Figure 3.4 Unity 4650 Top-level Screens

Recovery Abort (when applicable)

- Allows user to abort a recovery in progress or abort the result of an automated recovery - *or* -
- Allows user to adopt a recovered setting as a new permanent setting

Front-Panel Email (when applicable)

Allows user to read and clear unread email sent by network control

SW Download Status (when applicable)

Allows user to monitor the progress of a software download over satellite

Quick-List Control Screens (multiple)

A variable number of commonly-used control screens duplicated at the top level for easy access

RF Switch Bypass (when RF switch option is installed)

Allows the user to force the receiver to accept a carrier only at a designated feed port at all times

Installation Test

Allows user to implement special test modes useful at initial unit installation

Unit Status/History

Allows user to access unit status and diagnostics. *Typical* items located under this menu include:

1.Current unit state
2.Signal Quality
3.Last commanded and last successful unit settings
4.Program Analysis
5.Local audio/video decompression history
6.Network control status/history
7.Current LAN settings
8.Unit internal temperature
9.Option module presence/status
10.Unit information screen (including software version)
11.Control to clear diagnostics

Unit Setup

Allows user to control unit. *Typical* controls located under this menu include:

1.Set permanent unit settings (tuning, program, audio selection, etc.)
2.Add/edit/move/delete Presets
3.Genlock controls (shown if option is installed)
4.NTSC pedestal
5.Aspect ratio control
6.Rate buffer control (PCR offset)
7.Audio attenuation
8.Audio front-panel monitor selection
9.Muting
10.VBI line re-insertion enable
11.Recovery mode timeouts
12.Serial port setup
13.LNB LO frequency set
14.LNB DC power set
15.User cue relays
16.Signal quality indicator thresholds
17.Minimum alarm/warning indication times
18.Encryption controls
19.LAN settings
20.NVRAM operations
21.Alarm (history) latching enable
22.Current unit software selection
23.Unit label edit
24.Unit reset control

Home and default screens

The home screen appears on the LCD by default at boot up. During operation, the user may return to the home screen at any time, from any location in the menu hierarchy, by pressing the Escape (**ESC**) button repeatedly (or pressing and holding it). Regardless of the current location within the LCD menu hierarchy, if no front-panel keypress is made for more than 5 minutes, the LCD reverts to the default screen. Usually, this is the home screen. However, under some conditions (two are described below), another screen becomes the default. If more than one of these conditions exist simultaneously, priority is given in the order listed.

NOTE: Regardless of which screen is the current default, the user may still access all available screens using the left- and right-arrow, **ENT** and **ESC** buttons.)

Download Screen as default

If the U4650 is in an ACCEPT PACKETS Download state, then the Download screen becomes default.

Audio FP Monitor Selection Screen as default

For two minutes, or until **ESC** is pressed, the Level 2 Audio FP Monitor Selection screen is the default if the unit features a front-panel audio monitor jack and the user plugs in a ¼" stereo phone plug. Note that this is NOT usually a first-level screen, unlike other default examples.

On the home screen, the ► (right-pointing arrow) field will quickly flash (a half-second ON and a half-second OFF) to signal the user that the right arrow button is active for user control. Pressing either the left or right arrow buttons will cause the U4650 to display the other top-level screens in succession. If there are current alarm and warning indications, the text "See alarms" or "See Warnings" will appear before the arrow and pressing the right arrow will display the applicable alarm or warning message(s).

Interpreting LEDs

Front panel LEDs

Table 7: Front-panel LED Indicator Descriptions provides the meaning of the color and state of each LED.

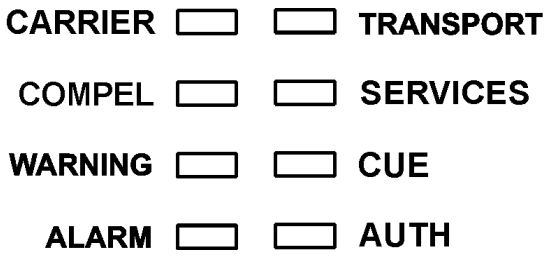

Figure 3.5 LED Indicators

Table 7: Front-panel LED Indicator Descriptions

Indicator Label	Color and State*	Meaning
CARRIER	GREEN constant	Unit has demod and FEC lock on the RF carrier
	Off	Unit does not have demod and FEC lock on the RF carrier
TRANSPORT	GREEN constant	Unit recognizes a valid transport stream
	Off	Unit does not recognize a valid transport stream
COMPEL®	GREEN constant	COMPEL control stream received within last two minutes (including keep-alives) while locked continuously on the current transport stream for >2 minutes
	GREEN flash	Unit has had a verified transport stream for >2 minutes and COMPEL is required but no valid COMPEL
	GREEN flutter	COMPEL has been addressed to unit within last 5 seconds (excluding keep-alives)
	Off	Otherwise. Note that this LED must be OFF when there is no valid Transport stream OR COMPEL
SERVICES	GREEN constant	Unit is processing services for delivery
	Off	Unit is not processing services
WARNING	YELLOW constant	One or more warning indications exist, usually the failure of a non-essential item, or to warn of an impending failure of an essential item
	Off	No warning conditions

Table 7: Front-panel LED Indicator Descriptions

Indicator Label	Color and State*	Meaning
CUE	GREEN constant	A user cue relay is closed (energized).
	GREEN flutter	During a user relay "pulse" activation on any relay.
	Off	All user cue relays are open (de-energized).
ALARM	RED constant	One or more current alarm indications.
	RED blink	An alarm event has occurred in the past and has not been acknowledged and cleared by the user. Note that this state may exist together with a current alarm (RED constant). In that case, the blink state is defined as quickly cycling OFF-ON-OFF (~100ms each) approximately every 2 seconds.
	Off	No alarm condition currently exists.
AUTH	GREEN constant	Unit has transport MPEG sync and the stream is not scrambled (in the clear). Streams that are "clear" are always presumed to be "authorized". OR Unit is authorized for current scrambled transport stream (or selected program) and has transport MPEG sync. When using Wegener CA ('97 Version), being "authorized" means being addressed with current and valid ciphered keystream messages. In a PIN system, if the transport stream is scrambled, and the unit has been programmed with any key other than the null '00000', then it presumes that it is "authorized".
	GREEN flutter	Unit has successfully deciphered a valid descrambling seed in the last five seconds. Normal behavior in functioning CA system.
	Off	Unit has transport sync, the transport stream is scrambled, and the unit is NOT authorized. Also OFF if no transport sync.
* LED states are defined as follows: Blink - alternating ON for ~100ms and OFF for ~2 seconds; Flash - alternating ON for ~500ms and OFF for ~500ms. Flutter - like flash but with shorter ~100ms ON and OFF times.		

Ethernet Status LEDs (rear panel)

The Ethernet jack has two LEDs which provide the following indications:

LAN – **Green** LED: On if active LAN connection detected. OFF otherwise.

ACT – **Yellow** LED: Flashing ON if ethernet packets are output or addressed packets are input. OFF otherwise.

Genlock Status LEDs (rear panel)

When the Digital A/V Pro Option is installed, there are two LEDs located to the left of the GENLOCK REF IN jack. Note that both LEDs are off if genlock is not enabled (or if the option is not installed):

SYNC – **Green** LED: ON if genlock is enabled and IRD's A/V display system is locked to genlock reference timing. OFF otherwise.

[unnamed] – **Red** LED: ON if genlock is enabled and no successful genlock. OFF otherwise.

ASI Input Status LEDs (rear panel)

When the ASI Transport Input Option module is installed, there are two LEDs located to the right of the ASI IN jack. Note that, in related options, both LEDs are off if the ASI Input is not selected. If the ASI Input is selected, one LED is always ON:

[unnamed] – **Green** LED: ON if locked to valid ASI Transport input. Lock is defined as having frame sync without buffer over/underflow in last 5 seconds.

[unnamed] – **Red** LED: ON if not locked to valid ASI Transport input.

Front-panel audio monitor

To monitor audio output from the front panel, insert a 1/4-inch stereo phone plug into the audio monitor port. The U4650 will detect the phone plug and immediately display the Audio FP (front-panel) Monitor Selection screen. This second-level menu screen allows the user to select and monitor the desired audio stream. After two minutes without a keypress from the front panel, the U4650 will revert to the default LCD screen.

3.3 Operation from Local/Remote Terminal

Overview and syntax

The following discussions apply to control by both the Terminal and Modem devices. Once a user has fulfilled the password requirement for Modem access, the communication is identical to Terminal control.

Commands listed in this section detail command syntax and action taken. Commands consist of a command field and a parameter field. Each command field and parameter field is space delimited. Optional parameters are indicated by square brackets, [ ], and conditional parameters are indicated by braces, {}.

For example, COMMAND_NAME *parameter1* {*parameter2*} [*parameter3*] indicates that *parameter1* must be entered, *parameter2* entered only when a certain condition is met (certain option is installed, etc.), and *parameter3* is optional. Both commands and parameters may be entered in upper or lower case; the interface is not case-sensitive.

Incorrect or incomplete commands result in "Invalid Command" being displayed at the terminal. Parameter errors on User commands generate "Invalid *parameter name*" where *parameter name* is the name of the incorrectly entered parameter.

User commands

NOTE: Any commands controlling carriers, programs, or services may be disabled from COMPEL®.

ABORT

Insert is terminated. See TEMP command.

ABORTREC *x*

x: C - make the unit's permanent setting equal to the last commanded setting
S - make the unit's permanent setting equal to the last successful setting

Command either 1) aborts an ongoing automated recovery; 2) aborts the successful results of an automated recovery; or 3) accepts the successful results of an automated recovery. With either value for *x*, this command is interpreted as a direct local user command to establish/confirm the unit's permanent settings.

ADDE *location COMPEL-req [tags-req] [aud1] [aud1_rt] [aud2] [aud2_rt] [margin]*

location: Value from 1 up to max (highest entry #) indicating location in Preset table.

COMPEL-req: Values are REQ, NR, or GL. Forces COMPEL® to be temporarily required, not required, or left as normal global unit setting (respectively) when attempting this Preset during Recovery.

tags-req:Values are REQ, NR, or GL. Forces Carrier ID Tags to be temporarily required, not required, or left as normal global unit setting (respectively) when attempting this Preset during Recovery.

aud1: Language descriptor (or wildcard '*') for audio stream to be assigned to Audio port 1.

aud1_rt:

S - Stereo (left and right components routed as connected at original MPEG encoder)
1 - Original left component to both L and R outputs
2 - Original right component to both L and R outputs
M - Sum of left and right components to both L and R outputs
R - Reverse of "Stereo" above (if allowed by hardware)

aud2: Language descriptor (or wildcard '*') for audio stream to be assigned to Audio port 2.

aud1_rt: Same as *aud1_rt* above

margin: Margin offset in dB. Ranges between 0 and N dB. (See MARGIN command for N.)

This command augments the ADDS command to populate the extended Preset Entry. Note that if this Preset is used to acquire services (through Recovery or user command), these temporary COMPEL and Tags-required parameters, if used, will be adopted as the permanent global unit parameters.

ADDS *location [format] [feed #] [carrier freq] [data rate] [FEC] [Tag Site] program# [label]*

location: Value from 1 up to max (highest entry #) indicating location in settings table.

For *format*, *feed #*, *carrier freq*, *data rate*, *FEC*, *tag site*, *program #*, and *label* see PERM command.

The command to add entries to the U5000-style preset table at the entry number given. If entry at location was already in use, it will be overwritten.

APPSTAT

Forces IRD to report the status of the two application storage spaces, showing current and backup application software (if any).

A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

APPSWITCH

Unloads the currently executing application software and, instead, loads and runs the backup software.

ARMODE *mode*

mode:

auto - the output aspect ratio is the same as the input, whether 4:3 or 16:9.
4:3 - the output aspect ratio OUTPUT is forced to 4:3.

Command to set the aspect ratio mode.

AUDATTEN *port# atten*

port#: Either "1" or "2" for audio ports 1 or 2.

atten: Must be a numeric value for attenuation in dB. Legal values are given in individual IRD specifications.

Command to set audio attenuation, where '0' gives 0dB attenuation (maximum level). A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

AUDIOMODES

Lists all the supported audio decompression or pass-through modes (e.g. MPEG1 Layer 2, Dolby AC-3, MP3, SMPTE302, etc.)

AUDMON *port#*

port#: Either "1" or "2" for audio ports 1 or 2.

Connects a sample of audio port *port#* to the single audio monitor jack (where available). A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

AUXPID *[PID]*

PID: Selects the PID (in hex) for the Transport packets carrying the desired data stream. Must be '20' to '1ffe' inclusive. If PID is omitted, the current value is displayed.

Sets the PID used for Aux Data extraction.

CLRDIAG

Clears all the volatile counts and statistics, as if the unit was reset. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

CLRIND

Clears both current "Acknowledged" Alarm and Warning indications and (past) Latched Alarm indications. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

DELS *entry*

entry: Value from 1 up to max (given in section 2.1) indicating entry number in settings table.

Deletes an entry in the Preset Table.

DPAT

Command reports current Program Allocation Table (PAT) from incoming transport stream.

DPSI

Command reports complete PSI information tracing all programs and their components to MPEG PIDs. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

DTMFTST *[level] [tone]*

level: Integer between 0 and 100 inclusive.

tone: Tone code (0-15 signifying digits 1-9,0,*,#,A-C).

Volatile test command for DTMF output, if supplied. Tones will be output at the percentage of full-scale voltage indicated by level. If tone is supplied, then that tone is output continuously. If tone is omitted, then the IRD cycles endlessly through all tones, 1 second per tone. Disable with TESTOFF command. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

DTMFVOL *percent*

percent:Integer between 0 and 100 inclusive.

Command to set DTMF output tone levels. Immediately after entry of the command, the IRD will play out all 16 tones (at a rate where they are individually identifiable) at the commanded level. If *percent* is '0', output is essentially OFF. If *percent* is '100', level is maximum spec level. Entering command without parameters still plays out the tone sequence and then reports current level setting. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

EMAIL *x*

x: Either "E" for Enabled, or "D" for Disabled.

Command to enable COMPEL® printed email. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

ERRORS *type threshold*

type:Either "E" for Error'd Seconds or "C" for Continuity-count errors.

threshold:Integer between 1 and 255.

Command to set either Error'd-seconds-rate or Continuity-count Alarm threshold. Unit will show an alarm if, over any previous 60 second interval, the number of type events which are detected exceeds threshold. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

FORCERF *port*

port:Either OFF or the numbers 1, 2, 3, or 4.

Command to either disable or enable effective RF switch bypassing. If *port* is a number, then all subsequent carrier reception is sought at that RF feed port, regardless of the current Unit Setting. If *port* is OFF, then normal RF switch function is restored. Entering the command without parameters gives current status, either "Normal RF Switch", or "Forced RF Feed Port **n**" where **n** is either 1, 2, 3, or 4. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

GHOSTLIST *action PID*

action: 'A' for add or 'D for delete.

PID: hex number between 1 and 1ffe (except 11, reserved for SDT).

Command to add or delete entries in the list of ghost PIDs to pass to the ASI transport output (while Program Mapping is enabled). Entering command without the *action* or *pid* parameter dumps the current list.

GLDELAY *time*

time: Integer between -9000 and +9000 inclusive.

Command to adjust the horizontal delay of genlocked video output, relative to the reference. The delay in nanoseconds (ns) is set by the *time* parameter, with the actual register values set for the nearest 2.3 ns of adjustment resolution. Positive settings of *time* will force the video output to lead the genlock reference. For example, a setting of +3 directs the unit to use +2.3 ns of forward offset (1/16 of a 27 MHz clock tic). Entering this command without the *time* parameter causes the unit to report the current H offset setting.

GLENABLE *enable*

enable: ON or OFF.

Command to enable or disable genlocking. If *enable* is ON, genlock is enabled. If *enable* is OFF, genlock is disabled. Entering this command with no parameters gives the current setting.

GLPHASE *phase*

phase: Integer between -180 and +180 inclusive.

Command to adjust the subcarrier phase of genlocked composite video output, relative to the reference. The offset in degrees is set by the *phase* parameter, with the actual register values set for the nearest $\sqrt{2}$ degrees of adjustment resolution. Positive settings of *phase* will force the video subcarrier phase to lead the genlock reference. For example, a setting of -10 directs the unit to use -9.9° of backward offset. Entering the command without the *phase* parameter causes the unit to report the current SC phase offset setting.

H [*command*]

command: Any of the terminal command names (PC, R, PORT, etc.).

If an 'H' or any invalid command beginning with an 'H' is entered and *command* is omitted, the whole help screen will be displayed, consisting of a list of all currently available commands and a brief description of each listing. If an 'H' or any invalid command beginning with an 'H' is entered and *command* is a valid User Command Name, then detailed help for *command* is displayed. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

INDPERS *indication time*

indication:"A" (for "Alarm") or "W" (for "Warning").

time:Time in seconds.

Command to set the minimum indication-time persistence for either Alarms or Warnings, per the value of indication, for the time period given by time. Entering command without parameters shows the current settings. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

IPCONFIG

Command requests report of all current IP parameters (IP address, Gateway address, subnet mask) and assignment mode (static or DHCP). A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LAN GATEWAY *addr*

addr:IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255.

Command sets the IRD's static internet Gateway IP address. No protection is offered against entry of non-standard addresses (e.g. 0:0:0:0). Omitting the addr parameter shows the current static Gateway IP. This will not be the current Gateway IP address if dynamically assigned. Use IPCONFIG command for that. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LAN IP *addr*

addr:IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255.

Command sets the IRD's static IP address. No protection is offered against entry of non-standard addresses (e.g. 0:0:0:0). Omitting the addr parameter shows the current static IP. This will not be the current IP address if dynamically assigned. Use IPCONFIG command for that. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LAN MODE *mode*

mode:"DHCP" or "STATIC".

Command sets the IP configuration to either dynamic DHCP or static IP addresses. If static, see LAN IP, LAN GATEWAY, and LAN SUBNET commands. Omitting the mode parameter shows the current mode. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LAN SUBNET *addr*

addr:IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255. Note that not all values can be legal.

Command sets the IRD's static subnet mask address. Command entries that do not assert legal IP address masks will be rejected. Omitting the addr parameter shows the current static subnet mask. This will not be the current subnet mask if dynamically assigned. Use IPCONFIG command for that. A Local Control Command (available from the terminal regardless of "Local Control Enable/ Disable" commands from the network).

LATCHALARMS *x*

x: Either 'E' for Enable, or 'D' for Disable.

Command enables or disables the latching of unit alarms.

LNBPWR *output*

output:Either ON or OFF.

Non-volatile command enables or disables LNB DC power independently of any other settings. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LNBTST *voltage_range tone*

voltage_range:Either H or L (for High and Low).

tone:Either ON or OFF.

Volatile test command to force use of the ASTRA Universal LNB functions. Disable with TESTOFF command. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

LOADNV *source*

source: "B", "C', or "P" for Backup (by user), Original Customer-configuration, or Production-default settings, respectively. Key security parameters (e.g. serial number) are not affected by the C or P loads.

Command reloads NVRAM memory from Flash memory defaults. Note that unit must reset after execution of this command.

MARGIN *margin_offset*

margin_offset:Integer values between 0 and N in the form of x.x, representing dB (to tenths of a dB). N is defined by individual IRD specifications for every modulation/FEC combination.

Command sets the Margin Warning point. This provides warning to local users that their Eb/No's are approaching the error-threshold where system performance will collapse. (Supersedes **SNR** command.) A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

MOVEP *source destination*

source: Preset Table entry number which will source Unit settings.

destination: Preset Table entry number to which the Unit settings will be moved.

Command moves the Unit settings at the *source* entry to the *destination* entry. The setting data at the original *source* entry is deleted and that entry position is now considered unused. The setting data at the original *destination* entry is then moved to the next lower unused Preset position. (One will always be available because the entry that held the original source settings was made "unused".)

MUTE *[source][source][source] [...]*

source: If no source is specified then video and all audios are selected. Source can be any of the following:

ASI -	to indicate the DVB-ASI transport output.
V -	to indicate Video.
A[specifier] -	To indicate Audio. An 'A' without the specifier indicates all audio outputs. If present, The specifier consists of one or two characters. The first character specifies the audio port number and the second character specifies either the right or left channel, as in "A1L" (audio 1, left channel) or "A2R" (audio 2, right channel). If the second character is omitted, this indicates both stereo channels are included.

Mutes the specified outputs. Example: "MUTE V A1L A4 A3R" mutes the video, audio Port 1 left channel, audio port 4 (both channels), and audio port 3 right channel.

OH

On hook. Disables modem access. Modem access is only re-enabled by successful modem password entry. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

PARTPID *pid*

pid:Hex value between 20 and 1ffe to set a value and 0 to disable.

Command sets the borderline (or "partition") PID at, and above which, the IRD may expect compatible scrambling against which it may apply the proper descrambler. PIDs below this point may be scrambled with an alien, 3rd party system. See individual IRD specs for more detail on unit behavior. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

PC *device baud*

device: one of MODEM, TERMINAL, AUXDATA, CA or COMPEL®.

baud: 1200, 2400, 4800, 9600, 19200 or 38400.

parity: N, E, or O.

Configures communication parameters for any serial device. A Local Control Command (available from the terminal regardless of "Local Control Enable/ Disable" commands from the network).

PERM *[format] [pol/feed#] [carrier freq] [data rate] [FEC] [Tag Site] [program#] [label]*

format: If an RF input, one of the legal modulation formats: QPSK (for "DVB-QPSK"), 8PSK (for "DVB 8PSK"), TQPSK (for "Turbo-QPSK"), T8PSK (for Turbo-8PSK), T16QAM (for Turbo-16-QAM), or 16QAM (for "DVB 16QAM"). For an ASI Transport input, specify ASI. May be omitted if DVB-QPSK. If this parameter is set to "OK", then the current setting, if a Transient setting, becomes the new Permanent setting.

pol/feed#: If an RF input, one of four possible RF feeds, 1, 2, 3 or 4. If an ASI input, one of two possible ASI feeds, 1 or 2. Omit this field for RF inputs if RF switch option is not installed.

carrier freq: If an RF input, the downlink carrier frequency in MHz (precision to two decimal places OK). Field is omitted for an ASI input only.

data rate: If an RF input, the Transport data rate in Mbps (precision to two decimal places OK). Field is omitted for an ASI input only.

FEC: If an RF input, the inner FEC ratio. Field is omitted for an ASI input only. The legal options are: for QPSK- 1/2, 2/3, ¾, 5/6, and 7/8; for 8PSK- 2/3, 5/6, 8/9; and for 16 QAM- ¾, and 7/8. Other legal values may be defined for new modulation formats.

tag site: If an RF input, the tag site for Carrier ID tag. Field is omitted for an ASI input only.

program#: Program number, '*' for wildcard, or null (for no program assigned).

label: Channel Label (optional, may be omitted).

Command to establish new Permanent Unit Setting with the parameter values given. If the format is set to OK, no other parameters are accepted or required.

PERMCH *value*

value: Either the value of a settings table entry number OR the Channel Label of an entry, priority given to Label if any ambiguity. If an entry number, legal values range from 1 up to N (where N is number of Preset support this product).

Unit Settings set to equal those in the Preset Table entry specified by *value*.

PING *[-t] [-n count] [-l size] [-w timeout] addr*

-*t*:If supplied as shown, PING specified host until interrupted by console-entry of 'control-C'.

-*n count*:Integer substituted for count is number of echo requests to send.

-*l size*:Send buffer specified as size bytes.

-*w timeout*:Wait for each reply the number of milliseconds specified by timeout.

addr:IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255.

Traditional Unix PING command with verbatim Unix syntax. Response from IRD will indicate success or failure. User will be warned if PING cannot be attempted because no local IP address has been set. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

PORT *device*

device: Device assigned to the AUX/TERM port, either TERMINAL, MODEM or AUXDATA.

Assigns the given device to the Aux/Term port. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

PW *password*

password: One to six alphanumeric characters.

Changes the modem password to password. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

R *type* [*page*]

type: Indicates the type of report as follows:

C	-	Carrier Status
P	-	Parameters
G	-	Group Status
GL	-	Genlock system (if installed and applicable)
M	-	MPEG PSI Status
NC	-	Network Controller Status
R	-	Relay Status
RTLOG	-	non-volatile log of last 10 "tuning" type commands
S	-	Settings Status
ST	-	Settings Table
SP	-	Serial Port Configuration

See also parameters for RP and RD commands.

[page]:This option can have a value of 1 to 40 and is only applicable for the group status report. Indicates the page to be reported. If omitted, all eight pages are reported and scrolls off the terminal screen.

With the **R** command, the user gets a combined report of unit non-volatile settings and status and diagnostics for each item grouping (e.g. RF for all unit settings and all status diagnostics for carrier acq/tracking). A Local Control Command (available from the terminal regardless of "Local Control Enable/ Disable" commands from the network).

RD *group*

group: Indicates group of status/diagnostic information to report, as follows:

AUD	-	Audio service diagnostics
AW	-	Alarm/Warning status
CA	-	Conditional Access diagnostics
DPI	-	Conditional Digital Program Insertion (DPI)
GL	-	Genlock system (if installed and applicable)
LAN	-	IP/Ethernet diagnostics
NTW	-	COMPEL® network control diagnostics
PRGMP	-	Program mapping at ASI output
MSC	-	Miscellaneous diagnostics
REC	-	Automated Recovery status
RF	-	Carrier Acquisition/Tracking diagnostics
RPA	-	Return Path diagnostics
SW	-	Software download/self-test status
TS	-	Transport Stream diagnostics
VID	-	Video service diagnostics

Expanded U4650 report on unit volatile diagnostic and status information. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RP *group*

group: Indicates group of parameters to report, as follows:

AUD	-	Audio services
AW	-	Alarm/Warning indications
CA	-	Conditional Access
DPI	-	Conditional Digital Program Insertion (DPI)
LAN	-	Ethernet/IP LAN
NTW	-	COMPEL® network control

MSC	-	Miscellaneous
PRGMP	-	Program mapping at ASI output
REC	-	Automated Recovery
RF	-	Carrier and RF
RPA	-	Return Path
S	-	Current Unit ("Perm") Settings
SER	-	Serial Ports
SW	-	Application software maintenance
TS	-	Transport Stream processing
VID	-	Video service

Expanded U4650 report on unit NV operating parameters. A Local Control Command (available from the terminal regardless of "Local Control Enable/ Disable" commands from the network).

RE *state [number]*

state: O or C meaning Open (ON) or Close (OFF), respectively.

[number]: 1 or 2 (or higher if relay option module installed) indicating the affected user relay. Both are specified if omitted.

This command sets the user relay addressed by number to the ON/OFF state specified. Command is non-volatile.

RESET

Resets unit. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RPATH

Command to display all return path non-volatile settings. A Local Control Command (available from the terminal regardless of "Local Control Enable/ Disable" commands from the network). A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RPATH FROM *domain*

domain:Legal string of keyboard characters in proper domain-name format (e.g. string1.string2.string3…)

Domain name portion of "from" email address in Return Path reporting. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RPATH RELAY *addr*

*addr*IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255.

IP address of local Mail Relay server, if any. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RPATH SEND

Command ordering IRD to immediately send a Return Path report. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

RPATH TO *username@addr*

username:Legal string of keyboard characters without white space.

addr:IP address formatted as n1:n2:n3:n4 where n1, n2, n3, and n4 are integers between 0 and 255.

Email address destination for Return Path reporting. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

SAVENV

Saves all the current global and Unit Setting NV parameters (in NVRAM) to the Flash memory space designated as "BACKUP". Note: Some unit-set parameters, which would not make sense to "back up", may not be saved. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

SAVEP *[entry#] [channel_label]*

entry#: A Preset Table Entry number or the text, "PERM". If a preset entry, must be equal to number between 1 and N inclusive, where N is highest entry number.

channel_label: Channel Label associated with a unit setting or a Preset Table entry. If attempting to supply the *channel_label* parameter alone, a value of "PERM" is not legal. Parameter must be a string of continuous non-white-space keyboard characters. Unit will truncate user input to 10 characters.

Command saves current Unit Settings to a Preset Table entry, or if *entry#* is "PERM", a current Transient Setting is loaded into the unit's Permanent unit setting. Those metadata fields in the extended Preset Entry that have no analog in the current Unit setting will be populated with spec defaults. User must use ADDE to set those fields.

If *entry#* is supplied alone, current unit settings are written to that entry, overwriting existing data if it had been in use. If *channel_label* is supplied alone, and if that same Label already appears at a used Preset Table entry, then the current unit settings overwrite that old Preset data. If channel_label is supplied alone and no used Preset has that Label, then the current settings are written to the lowest empty Preset Table entry and then given that same Label. If both *entry#* and *channel_label* parameters are supplied, then the current unit settings are written at that Entry (overwriting existing data if any) and that entry is supplied that same Label (equal to *channel_label*).

SERVICE *video_pid [pcr_pid] [audio1_pid] [audio2_pid]*

video_pid: Hex value between 20 and 1ffe.

audio1_pid: Hex value between 20 and 1ffe.

audio2_pid: Hex value between 20 and 1ffe.

pcr_pid: Hex value between 20 and 1ffe.

Command selects A/V services directly by PID number only. This changes Unit Setting #11 to “By PID” if not already set that way.

SET *[parameter] [value]*
SET TO *[destination] [time]*
SET FROM *[source]*

parameter: One of *format, feed, freq* [for "carrier freq"], *rate* [for "data rate"], *FEC, tag* [for "tag site"], *prog* [for "program"], *margin* [for "Eb/No margin warning zone"], *aud1*, or *aud2* [for "descriptors assigned to audio ports 1 and 2"]. See PERM and ADDE commands for definitions and limits.

value: Value of the parameter as in any settings command (PERM, TEMP, ADDS, etc.)

destination: PERM, TEMP, number or *label* of a table entry.

time: Length of insert in either HH:MM:SS format (valid range is 0:00:00 to 18:00:00, leading zeros OK to omit on hours) OR in number of seconds. (A one-hour TEMP could have a parameters: of 1:00:00 or 3600.)

source: PERM, CURR, number or *label* of a table entry.

SET sets the value of individual parameters in a 'scratch pad' settings group. **SET TO** will store the scratch pad settings to a search table entry or to the permanent or temporary settings (requires an insert time as a second parameter). **SET FROM** loads the scratch pad settings from a search table entry or from the current or permanent settings.

SETAUDIO *port route [program] [atten]*

port: Value of 1 to 6 indicating an audio port

route:
- S - Stereo (Left and Right components routed as connected at original MPEG encoder)
- 1 - Original Left component to both L and R outputs
- 2 - Original Right component to both L and R outputs
- M - Sum of Left and Right components to both L and R outputs
- R - Reverse of "Stereo" above (if allowed by hardware)

program: Can be a three character name or an '*'. If the 3-character name is specified, the unit will route the audio PES stream with the specified name to the port. If '*' is specified, the unit will default to the first audio program in the PMT that is not routed to another port.

atten: Must be a numeric value for attenuation in dB. Legal values are given in individual IRD specifications. This programs the net audio attenuation, where '0' gives 0dB attenuation (maximum level). If field omitted, attenuation remains unchanged on that audio port.

The audio PES stream, with the language descriptor *program*, is decompressed in the port audio port, and then its components are routed to the Left and Right outputs according to *route*. That ports attenuation is changed to *atten*, if supplied.

SETLABEL *label*

label: Unit label. Field entry is truncated at 10 characters.

Sets Unit Label displayed on IRD home LCD screen (and Terminal Welcome Banners).

SETLNB *{rf_feed} {LO_freq}*

Rf_feed: If the RF Switch expansion option is installed, this is one input to that switch (1 through 4). If no RF Switch option is installed, then it is an error to enter data here!

LO_freq: Either a number or mnemonic. If a number, this value represents the LNB LO frequency in MHz. It can have up to two decimal places and its valid range is from 0 to 14000.00. The legal mnemonics are "C" (for Standard C-band, 5150 MHz default), "KU" (for US Ku-band, 10750 MHz default), "EHKU" (for European Hi Ku-band, TBD MHz default), or "ELKU" (for European Low Ku-band, TBD MHz default).

(1) If the current LNB mode selected is Universal: This command is legal only when entered without parameters. In this case, the IRD returns the current calculated setting command sent to the LNB (either "9.75 GHz" or "10.60 GHz").

(2) If the current LNB mode selected is LO: This command sets the assumed LNB LO frequency to the value entered in MHz OR the MHz value represented by the mnemonic. If there is an optional RF switch installed, then the rf_feed field data must be entered. Entering the command without parameters returns the current setting.

A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

SETPEDEST *xxx*

xxx: "E" for enable or "D" for disable.

Enables or disables the "pedestal" setup, the addition of +7.5 IRE to the luminance level of active NTSC video. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

SETPIN *value*

value: Decimal representation of PIN key, between 0 and 16777215.

Command sets the PIN scrambling key number.

SETTIMEOUT *source time*

source:
- 1 - Not used. (In legacy IRDs, this was Fade timeout.)
- 2 - Services Recovery Timeout. (In legacy IRDs, this was Installation timeout.)
- 3 - Network Recovery Timeout. (In legacy IRDs, this was No COMPEL® timeout.
- 4 - Recovery Iteration Time. (In legacy IRDs, this was Header Seek timeout.)
- 5 - Local Control Re-enable Timeout. (In legacy IRDs this was Local (Control) Recovery timeout.)

time: Time-out value in seconds or HHHH:MM:SS format. Minimum value is 1, and maximum value 35999999 (9999:59:59 hms) for all others.

Command sets Automated Recovery timeout specified by *source* to the value specified by *time*.

SETUID *[id]*

id: Unit ID number between 00 and 99 inclusive.

Command for assigning the unit ID number for gaining "talker" access on a shared serial bus. The factory default setting for id is '00', which also disables terminal daisy-chain capability. If the parameter is omitted, then this command returns the current unit ID setting. Command is only applicable to products that feature serial "daisy-chain".

SP *program*

program: Either an integer between 1 and 65,535 (representing a number) or an alphanumeric string (representing a name), preference being on a number to resolve ambiguity.

Command changes selected *program* by Program Number (from PAT) or SDT descriptor.

TEMP *[format] [feed #] [carrier freq] [data rate] [FEC] [Tag Site] program# time*

For *format, feed #, carrier freq, data rate, FEC, tag site,* and *program #,* see PERM command.

time: Length of insert in either HH:MM:SS format (valid range is 0:00:00 to 18:00:00, leading zeros OK to omit on hours) OR in number of seconds. (A one-hour TEMP could have a parameters: of 1:00:00 or 3600.)

Command which performs a volatile temporary insert for an amount of time given by time. Unit sets its temporary Unit Settings to the values given. <Note that no label may be applied using this terminal command.>

TEMPCH *value time*

value: Either the value of a settings table entry number OR the Channel Label of an entry, priority given to Label if any ambiguity. If an entry number, legal values range from 1 up to N (where N is number of Preset support this product).

time: Same as for TEMP.

Volatile command which sets volatile temporary Unit Settings to those retrieved from the Preset table according to *value* for time given by *time*. Similar to TEMP command.

TEMPSENS

Command displays internal unit temperature if available.

TEST *group value*

group:Mnemonic for a test group: Either RF, AV, DTMF, or REL.

value:Parametric value which has meaning depending on the test *group* selected.

Command to activate Installation Test Modes. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

If *group* is RF, the legal *values* are 1, 2, 3, 4, and OFF. Entering numbers for value cause the IRD to report the RF level (not locked to carrier) at that RF Feed Port every few seconds. Entering OFF stops the measurement.

If *group* is AV, the legal *values* are ON and OFF. If ON, a test pattern is activated on the video output and test tones activated on the audio output, the same as the generic TESTMODE command.

If *group* is DTMF, the legal *values* are ON and OFF. If ON, the command behaves like the DTMFVOL command entered with no parameters.

If *group* is REL, the legal *values* are ON and OFF. If ON, both user cue relays are alternately energized and de-energized.

TESTOFF

Command stops all volatile test functions as if unit were reset. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

UNMUTE *[source][source][source][...]*

source: Same as the MUTE command.

Identical to MUTE except specified services are unmuted.

VER

Displays the boot-up Welcome banner and the versions of hardware and software components within the IRD. Should include the unit serial number, model number, and customer ID. A Local Control Command (available from the terminal regardless of "Local Control Enable/Disable" commands from the network).

VBI *enable line field*

enable: Takes values of "E" or "D" for Enable and Disable respectively.

line: Line # where VBI data is normally to be re-inserted. Values below 7 or above 22 are illegal.

field: Field # where VBI data is normally to be re-inserted. Values are "1" or "2" (for upper and lower).

Command enables or disables VBI data re-insertion on the line and field indicated for those IRDs that support that function.

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Chapter 4 Maintenance and Troubleshooting

4.1 Maintenance

Maintenance of the Unity 4650 is limited to keeping the chassis clean and ensuring that cables remain firmly connected. Occasionally wipe the exterior with a soft, damp cloth to remove any accumulated dust and dirt and check that cables are securely attached.

The Unity 4650 incorporates security labels over some of the screws. There are no user-serviceable components within the U4650. Tampering with the security labels or opening the unit will void your warranty. If you have any questions, contact Wegener's Customer Service Department at the address or numbers listed under Customer Service.

4.2 General Troubleshooting

This section is not intended as an exhaustive list of all possible situations, but a list of the most common installation problems. Please contact us (see Chapter 5, Customer Service), with any problems you cannot resolve independently.

If you are experiencing any difficulties, first check the LED indicators on the U4650 front panel. See **Table 7: Front-panel LED Indicator Descriptions** on page 45 for details about the LED indicators. Note that during typical operation, the green **CARRIER**, **TRANSPORT**, **COMPEL**, **SERVICES**, and **AUTH** LEDS should be on.

No output or indications

If the unit provides no output and neither the LCD nor any LEDs are lit, there is likely a loss of AC power or the internal power supply has failed. Do the following:

a) Check that AC power cord is firmly connected at both ends.

b) Check that your AC power source is supplying AC power.

c) If both checks a) and b) are okay, contact Customer Service (see Chapter 5) before returning the unit for service.

No audio or video output

LEDS: **ALARM** ON and **CARRIER** OFF

The U4650 is unable to lock to an RF carrier at the selected RF port:

a) If the first front-panel alarm message is "No RF Signal", then: (1) either the outdoor antenna LNB is not operating or is not connected to the IRD at the selected RF port; or (2) the selected IRD RF port has failed; or (3) the IRD receiver card has failed. To rule out (1), verify that the LNB (and any intermediate line amplifiers) has DC power and trace the connection from the LNB to the IRD or try replacing the LNB. If a spectrum analyzer is available, look for the carrier at the L-band intermediate frequency (for domestic C-band satellites, this is 5150 minus the downlink frequency in MHz). To rule out (2), try connecting the RF cable to another RF port and select that port (or use RF Switch Bypass to force that other port). To rule out (3), try using another IRD.

b) If the first alarm message is "No Carrier Lock", verify the RF Feed Port, Carrier Frequency, Data Rate, FEC Ratio, and ID Tag (if Tags are in use) settings. Also verify that the LNB LO frequency setting (in the IRD) is correct for the selected RF feed port.

c) If the alarm message is "RF signal overload", then reduce the carrier power entering the U4650. Either add in-line attenuation (a splitter will do) or remove line amplification in the RF circuit between the LNB and the IRD.

LEDS: **ALARM** ON and **CARRIER** ON

The U4650 may not be authorized for the network's Conditional Access. If the **AUTH** LED is OFF and the alarm message, "Unauthorized for CA" appears, contact your network provider to gain authorization in its Conditional Access database.

Missing an audio or video output while others are okay

LEDS: **ALARM** or **WARNING** ON

Check the front-panel display for alarm or warning messages. **Table 8: Alarm and Warning Descriptions** on page 75 describes U4650 alarm and warning messages. If the message definitions are too technical to help debug the problem, report the messages to your network provider.

LEDS: **ALARM** and **WARNING** OFF

If no alarms or warnings are shown, suspect a bad connection or mis-programming of the U4650. (Typically, if the U4650 is unable to present services, it should be showing Alarms or Warnings. However, the unit *can* be set not to indicate, even though this is not recommended.) If audio or video are missing, check at the front-panel monitor jacks. If okay on the front monitors, check the signal connections from the rear of the unit to the destination. If an audio is missing from the rear-panel outputs and cannot be detected at the front-panel monitors, check that a valid audio stream is selected for that port and that the network provider has supplied non-quiet programming on that audio.

4.3 Alarms and Warnings

The alarm and warning system is intended to alert the local user of a present or impending loss of services. The tables below list many (but not all) of the possible alarm and warning messages that the U4650 may display. For problems you cannot resolve on your own, please contact Wegener Customer Service (see Chapter 5), and be prepared to describe your signal setup, U4650 configuration, and any displayed alarm and warning messages.

Alarms

An alarm is asserted when the unit is unable (or presumed to be unable) to perform a required function or deliver required services.

Warnings

A warning is asserted when an alarm condition is imminent or to indicate other conditions requiring user attention.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
App Self-testing	New application software was recently promoted from the backup to primary executing position and is now performing its initial self-test. This is a Warning for normal behavior and is not a fault.
App SW d-load fail	Download of application software to backup flash space has failed. Contact network TOC and advise.
App SW switch fail	Unable to switch to backup software from network command, usually because that software image is not available or corrupted.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
ASI TS muted	ASI Transport output has been muted per user or network command.
Aud **N** bad PES data *(**N**=audio port number)*	Requested audio PES stream for port **N** is invalid or cannot be decompressed or processed. There may be a problem in the hardware for that audio port or in the uplink Encoder.
Aud **N** buff overflow *(**N**=audio port number)*	Audio port **N** PES data buffer overflow. Audio PES data being delivered faster than can be decompressed. There may be a problem with the STC at uplink Mux or in the IRD.
Aud **N** cmd muted *(**N**=audio port number)*	Audio port **N** output muted by command from network or local user.
Aud **N** data lost *(**N**=audio port number)*	Audio port **N** PES data not available (buffer underflow). here may be a problem in the hardware for that audio port or in the uplink encoder. Check that PTS values in the audio stream do not grossly lead PCR.
Aud **N** LD not in PMT *(**N**=audio port number)*	No audio PID found in PMT with assigned language descriptor for hard-assigned port **N**. Check that the language descriptor requested by the user or network is actually assigned to an existing audio stream.
Aud **N** PID not found *(**N**=audio port number)*	Audio PID found in PMT with requested language descriptor but no PES data detected. Check uplink encoder.
Auto-Recovery	Auto-recovery in progress. This may be caused by any of the following problems on a previously commanded or successfully acquired transport stream: (1) IRD unable to deliver services for time exceeding Services Recovery Timeout; (2) IRD required to maintain connection to COMPEL® and IRD has not detected COMPEL for time exceeding Network Recovery Timeout; or (3) IRD detects invalid incoming COMPEL header.
Bad audio **N** PTS *(**N**=audio port number)*	Excessive jumps or jitter in Audio port **N** PTS values
Bad PMT	One or more Program Map Tables are corrupted. See "No PMT" indication.
Bad Sec Micro SN	Serial number read from secure processor does not match unit. There may be a an attempt at piracy, a defective NVRAM memory, or a defective secure processor.
Bad VBI Data F**N** L**M** *(**N**=field number; **M**=line number)*	VBI data for field **N**, line **M** is unrecognized or in an unsupported format. Contact TOC to confirm that the version of application code in your IRD is current.
Bad Video data	Video PES stream appears to be invalid. Check if other IRDs see similar problem on the same program.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
Bad Video PTS	Excessive jumps or jitter in video PTS values. There may be a defective uplink encoder or mux.
Cmd'd app SW switch	COMPEL-commanded application software switch (to backup app software).
Content for ASI N/A	Program content requested to route to ASI output cannot be found in over-satellite transport mux. Contact network TOC and advise.
Content Route error	ASI transport output bears no program content because a Content Routing Table has not been loaded from the network or is corrupt. Contact network TOC.
E_b/N_0 Margin warning	E_b/N_0 value less than sum of Threshold + Margin—evaluated over 10 sec. intervals. Unless the margin setting is incorrect, this indicates a marginal downlink.
FP email fail	An FP Email message was received which was corrupt or invalid. User should acknowledge the warning to clear, and then notify the network TOC.
Genlock ref unstable	Excessive color-reference resets, lost/re-locks of genlock ref, while enabled. This could indicate that genlock reference is unstable or invalid.
High Error Rate	High errored seconds rate, presumably useless signal—evaluated over 60 sec. intervals. Signal-to-noise ratio is insufficient or there is severe terrestrial or antenna cross-pol interference.
High RF level	There is carrier lock, but the RF signal level is too high.
ID Tag Mismatch	Carrier ID frequency text mismatch. User or network has entered carrier frequency text or tag site ID incorrectly or unit is on the wrong carrier.
ID Tags Lost	Carrier ID tags disappeared. There may be a failure at the uplink inserter (UMX5010) or loss of COMPEL® PID. See "ID Tag Mismatch" indication.
Invalid COMPEL Hdr	Invalid COMPEL header detected in incoming COMPEL messages. This will cause the unit to immediately attempt automatic recovery to a backup preset. The IRD is not set up for connection to this COMPEL system.
Invalid video format	Video format in requested program is not supported.
KMS stream lost	KMS stream lost after initially detected in this transport stream. There could be an uplink problem. See also "No KMS stream" indication.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
Lost COMPEL PID	Data traffic at designated packet ID (PID) for COMPEL has been lost for more than two minutes. See "No COMPEL" indication.
Lost VBI Data F**N** L**M** *(**N**=field number; **M**=line number)*	VBI data for field **N**, line **M** has disappeared. If any is expected, contact network TOC.
Low RF level	There is carrier lock, but the RF signal level is too low.
New app SW download	New attempt at application software download over transport.
New PAT with changes	The version number on the Program Allocation table has changed and a new program lineup has been submitted. Changes have been made on uplink transport mux.
New PMT with changes	The version number on one or more of the Program Map Tables has changed with a new PID lineup submitted. Changes have been made on uplink transport mux.
No ASI stream	Corrupt or missing input ASI stream. Only applicable if ASI input is available and selected. Check connection and source.
No audio for Port **N** *(**N**=audio port number)*	No "free" otherwise-unassigned audio can be allocated to wild-card-assigned port **N**. There may be fewer audio PES streams than installed audio ports. If so, explicitly assign a desired language descriptor to this audio port.
No Carrier Lock	Carrier lock cannot (or has not) been acquired and maintained. Check that requested settings are correct. Check RF level indication and RF connection. For new installations, check antenna pointing and polarization.
No COMPEL	Data traffic is detected at designated packet ID (PID) for COMPEL®. However, no valid COMPEL messages have been detected during the last two minutes. There may be no connection to the network. If required to maintain a connection, the unit will eventually attempt an automatic recovery to a backup preset. To debug, check that the COMPEL system at the uplink is functional and that the data connection to inserter (such as UMX5010) is good. Also check for fault indications or functional problems at UMX5010.
No COMPEL PID	No traffic detected at designated packet ID (PID) for COMPEL, so no connection is made to the network. The COMPEL PID setting in the unit may be incorrect. Also see "No COMPEL indication".

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
No Def for mapping	ASI transport output bears no program content because an Output Definition Table has not been loaded from the network. Contact network TOC.
No DHCP server found	IRD is required to get IP settings from DHCP server but none are detected on the LAN.
No genlock sync	No genlock sync, while enabled. This could indicate that genlock reference is unconnected or invalid.
No ID Tag found	No carrier ID tags in COMPEL® stream. Set IRD not to expect ID tags or check uplink UMX5010.
No KMS stream	No KMS stream detected since transport stream acquisition. Unit will not be authorized if not connected to the KMS stream. Check that KMS PID is set correctly in unit. If okay, check the uplink.
No LAN detected	No Ethernet LAN connection. Check LEDs on rear and check other devices on the LAN.
No PAT	No Program Allocation Table detected in input carrier (or terrestrial interface). Check that legal ISO transport is available from uplink mux. Often, this indication may appear when the connection between the uplink transport mux and the DVB modulator is lost.
No PCR	No Program Clock Reference found, either in video or stand-alone PID. Check uplink mux or that program's encoder.
No PMT	No Program Map Table found for a program listed in PAT. This could be a fault in the uplink mux.
No RF signal	No carrier lock with low RF signal power indication. There may be a disconnected RF signal. Check connection and check that LNB has DC power.
No SDT entry	No Service Descriptor Table, or the table is corrupt or missing proper entries. Uplink mux may not support this DVB feature or may have fault.
No valid software	No valid application software available in either the primary or backup flash positions. Unit will need service.
No VBI Data F**N** L**M** *(**N**=field number; **M**=line number)*	VBI data not found in video user data or PID for Field **N** line **M** If any is expected, contact network TOC.
PAT disappeared	Formerly valid Program Allocation Table ceases to be received or becomes corrupt. See "No PAT" indication.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
PAT version changed	Version number in Program Allocation Table has changed but no change to program lineup.
PCR disappeared	Formerly valid Program Clock Reference ceases to be received or becomes corrupt. See "No PCR" indication.
PCR jitter	Excessive jitter in Program Clock Reference values. This may degrade timing of output video signals. Check uplink encoder for that program.
PCR value jump	Unrecoverable transition in incoming Program Clock Reference values. This has forced re-initialization of services. Check uplink encoder for that program.
PMT disappeared	Formerly valid Program Map Table ceases to be received or becomes corrupt. See "No PMT" indication.
PMT version changed	Version number on one or more of the Program Map Tables has changed but no change to PID lineup.
Prog blackout on ASI	Some services available from satellite not routed to IRD ASI output per program mapping instructions from COMPEL®. This is not necessarily a fault.
Program in blackout	Selected program not available for local decompression because this program content was blocked to ASI transport output by network. Contact network TOC.
Program not found	Program selected for local decompression (to local audio/video outputs) not available-invalid Program number for this Transport.
Reverted to b-up app	User-requested application failed self-test and Unit reverted to Backup application. Notify your network TOC.
RF signal overload	No carrier lock with RF signal power above specification range. There may be too much line amplification in RF feed.
SDT disappeared	Formerly valid Service Descriptor Table ceases to be received or becomes corrupt. See "No SDT entry" indication.
Sec Micro no resp	Secure processor does not respond to local host or may be missing. SIM card may be mis-installed, loose, or defective.
Sel Program not Auth	User-selected program is not authorized by (PPA) CA system.
Ser pt **N** fail *(**N**=audio port number)*	Unknown or miscellaneous hardware failure on serial port **N**.

Table 8: Alarm and Warning Descriptions

LCD Alarm or Warning Message	Meaning / Possible Cause
Ser pt **N** input fail *(**N**=audio port number)*	Input buffer overflow on serial port **N**. Send device at uplink may be set too fast compared to IRD serial port device, especially if sending data constantly with only one stop bit. Try changing to 1.5 stop bits.
Ser pt **N** output fail *(**N**=audio port number)*	Output buffer overflow on serial port **N**. Send device at uplink may be set too fast compared to IRD serial port device, especially if sending data constantly with only one stop bit. Try changing to 1.5 stop bits.
Setting out of range	Current unit setting combination is illegal for installed receiver card. Unit will be unable to acquire a carrier and transport stream until corrected by the user.
Test Mode in use	One of the installation test modes is being used. This may interfere with normal unit operation.
Unauthorized for CA	Unit unauthorized for Conditional Access in use. Contact network provider. Also see "No KMS stream" & "KMS stream lost" indications.
Unauth for some Prog	Unit is not authorized for some programs shown in PAT (not necessarily selected for local decompression).
Unit overheating	Unit overheating. Check that unit vents are not blocked and that internal fan is connected and operating.
Unread FP email	Unread Front-Panel email message present. Warning should clear after user opens the screen containing the email.
Using backup settings	Current permanent unit settings derived from successful Auto-Recovery. User should review settings and restore to primary if desired.
VBI format not valid	VBI data for selected program transmitted with unrecognized or unsupported protocol.
Video Buff overflow	Video PES data buffer overflow. Video PES data is being delivered faster than can be decompressed. There may be a problem with the STC at uplink mux or in the IRD.
Video cmd muted	Video output muted by command from network or local user.
Video not found	Video PES data cannot be found at PID declared by PMT. There may be an uplink mux or encoder failure.
Video PES data lost	Video PES data in selected program is unavailable. There may be an uplink encoder failure.

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Chapter 5 Customer Service

5.1 Warranty

The following warranty applies to all Wegener Communications products including the Unity 4650:

> All Wegener Communications products are warranted against defective materials and workmanship for a period of one year after shipment to customer. Wegener Communications' obligation under this warranty is limited to repairing or, at Wegener Communications' option, replacing parts, subassemblies, or entire assemblies. Wegener Communications shall not be liable for any special, indirect, or consequential damages. This warranty does not cover parts or equipment which have been subject to misuse, negligence, or accident by the customer during use. All shipping costs for warranty repairs will be prepaid by the customer. There are no other warranties, express or implied, except as stated herein.

5.2 Technical Support

If the unit should fail to perform as described, if you need help resolving problems with your Unity 4650, or for questions about obtaining service for your Unity 4650, please contact Wegener Communications Customer Service at (770) 814-4057, FAX (678) 624-0294, or e-mail service@wegener.com.

To return a product for service:

a) Obtain a Return Material Authorization (RMA) number by completing and faxing a copy of the RMA Request Form to (678) 624-0294. You may e-mail the same information instead to: service@wegener.com

b) To help us identify and control returned units, plainly write the RMA number on the outside of the product-shipping container. This will help us return your unit to you as quickly as possible.

c) Return the product, freight prepaid, to the address below:
   Service Department RMA# _____
   Wegener Communications, Inc.
   359 Curie Drive
   Alpharetta, GA 30005

NOTE: All returned material must be shipped freight prepaid. C.O.D. shipments will not be accepted.

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Appendix A Monitoring and Control Details

A.1 Basic Navigation

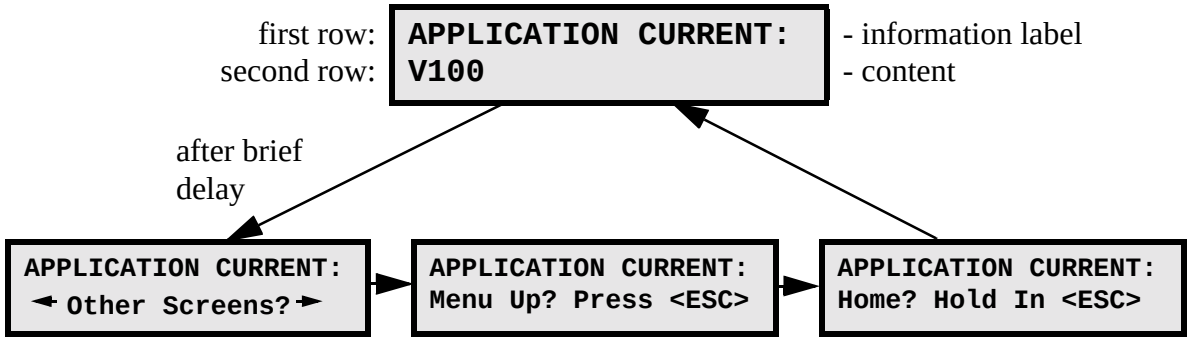
Monitoring and control of the U4650 from the front panel is accomplished by first navigating to the appropriate screen for the desired function (see **LCD screen relationships** and **LCD screen content** on page 41 for screen structure and contents). Press **ENT** to move downward through menus and screen levels and **ESC** to return upward through the screen structure. Press the right- and left-arrow buttons to move between peer screens. The home screen may always be reached by pressing and holding the **ESC** button or by pressing it repeatedly.

A.2 Info Screens

Info screens are read-only and display information that cannot be edited. The home screen is this type of screen. Other screens of this type display U4650 status or navigation helps.

For info screens like the Software Application Version screen shown below, the text on the second row will contain the current information (the software version in this example). If no key presses are made, after a brief delay, the second row begins alternating between this content and the following navigation prompts:

`◄Other Screens?►`	(to move to other screens at the same level),
`Menu Up? Press <ESC>`	(to move to the parent menu screen), and
`Home? Hold In <ESC>`	(to return to the Home screen).

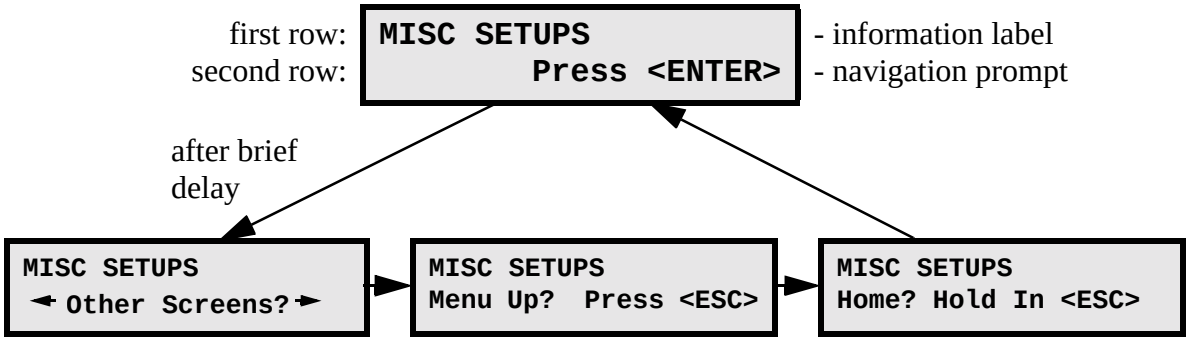


A.3 Menu Screens

Menu screens are also read-only and display the menu name for a group of screens. For example, the Miscellaneous Setups screen is a menu screen. The child screens "beneath" a menu screen (reached by pressing **ENT**) may be any of the screen types (i.e. other menus, information screens, etc.

For menu screens like the Miscellaneous Setups screen below, the text on the second row will cycle between the following prompts:

Press <ENTER>	(to move to the child screens),
◄Other Screens?►	(to move to other screens at the same level),
Menu Up? Press <ESC>	(to move to the parent menu screen), and
Home? Press <ESC>	(to return to the Home screen).

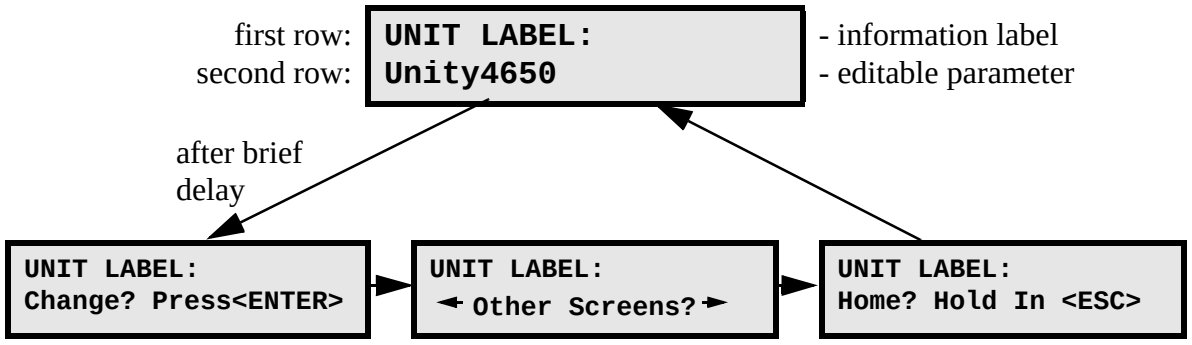


A.4 Parameter Screens

Parameter screens display a specific parameter that *can* be edited (if the correct authority has been established). Such screens contain an alphanumeric or list-select field. There are no carries or borrows when wrapping on a numeric field (i.e. to go from 0999 to 1000, 4 digits must be edited).

For parameter screens like the Unit Label screen below, the second row contains the current value of the parameter. Upon pressing **ENT**, a blinking underscore appears under the first character to be edited (Only for editable alphanumeric fields. List-select fields will not display a cursor). Use the arrow buttons to scroll through characters or list selections. After making the desired change, press **ENT** again to commit the entry to the U4650. Press **ESC** if you wish to cancel the change. If no key presses are made, after a brief delay, the second row begins alternating between the following prompts:

Change? Press<ENTER>	(to begin editing the parameter),
◄Other Screens?►	(to move to other screens at the same level),and
Home? Hold In <ESC>	(to return to the Home screen).



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Index

A

ac power connector 31
ad avail 19
agency approvals 13
air flow for safe operation 26
alarm
  definition 19
ALARM LED 46
alarm/cueing
  connector 30
  relays 13
amperage, unit 9
anchor screws 27
angle brackets 27
application software 19
approvals by agency 13
ASI 19
audio
  connectors 30
  fp monitor selection screen 45
  output 10, 11
audio language descriptor 20
audio monitor, front-panel 47
AUTH LED 46
authorized stream 46
automated recovery 20
auxiliary data async input 12

B

baud rates 12
bolts, anchor 27
boot loader 20
brackets, mounting 27

C

cables
  connecting to unit 28
  routing of 27
CARRIER LED 45
CE certification 13
changes to manual, suggestions for 7
chassis
  cooling of 13
  description of 8
  dimensions of 13
  earthing 26
  opening 19
circuit overloading 26
claims of damage 25
classification by FCC 13
cleaning the U4650 73
clearance around unit 26
command syntax 48
comments or suggestions 7
commercials 19
COMPEL 20
  input 12
  LED 45
COMPEL, 20
components, user-serviceable 19, 73
composite video output 10
conditional access 9, 20
connecting the unit 28
connection to supply circuit 26
connectors, rear-panel 28
consumption, power 9
contacting Wegener regarding manual 7
controlling the U4650
  remotely 48
cross supports 27
CUE LED 46
customer service 83

D

damage claims 25
decompression, audio and video 10
default LCD screens 45
demod and FEC lock 45
demodulator/FEC specifications 14, 15, 16
description of U4650
  functional 8, 37
  physical 8
descriptor
  audio language 20
  service 23
desktop installation 27
difficulties with the U4650 73
digital program insert (DPI) 20
digital video broadcast (DVB) 20
dimensions of chassis 13
down arrow 40
download
  screen 45
DPI 20
dual-tone multi-frequency (DTMF) 20
  output 12
DVB 20
DVB-ASI 19

E

earthing 26

Eb/No,energy-per-bit noise density per hertz 20

elevated operating ambient 26

e-mail address
- customer service 83
- regarding manual 7

email, front-panel 13

environment for mounting 25

environmental specifications for the U4650 13

equipment
- earthing 26
- power ratings 26

equipment rack 25, 27

Ethernet 20
- connector pinouts 31
- port specifications 12
- shielding of cable 25

European certification 13

F

fax number
- customer service 83
- manuals 7

FCC
- classification 13
- emissions suppression mandated by 25

FEC lock 45

Federal Communications Commission 13

formatting of serial ports 12

frequency of supplied power 9

front brackets 27

front panel
- connectors 32
- monitors 12
- operation from 37

front-panel
- audio monitor 47
- email 13

functional description 8, 37

G

grounding 26

H

handshaking 12

height of chassis 13

help 83

housing, U4650 8

I

IEC receptacle 31

illustration
- front-panel LEDs 45
- pushbuttons 40
- rear panel 28
- transport in options 29
- U4650 photo 8

info screens 85

inspecting the U4650 25

installation 25
- desktop 27
- rack 27
- safety during 19

integrated receiver-decoder (IRD) 21

interference, radio 25

K

Keep-alives 21

key management system (KMS) 21

L

labels, security 19, 73

LAN 20, 21

LCD 21

LED
- definition 21
- indicators 45

left arrow 40

light-emitting diodes (LEDs) 21

liquid crystal display (LCD) 21

LNB
- DC power 15
- power connector 32

loading, mechanical 26

local-area network (LAN) 21

location and mounting 25

lugs, grounding 26

M

mailing address
- customer service 83
- manual comments or questions 7

maintenance 73

mechanical loading 26

menu screens 86

modem dialing 12

monitors, front-panel audio and video 12

mounting
- desktop 27
- equipment rack 27
- location and 25

Moving Picture Experts Group (MPEG) 21

MPEG transport stream
- definition 24

multi-unit rack assembly 26

N

National Television System Committee (NTSC) 22

network protection mode 22

NTSC 22

O

opening the chassis 19
operating ambient temperature 26
operating temperature 13
operation of the U4650 37
option
  ASI transport input 18
  DVB-QPSK receiver (no RF switch) 14
  DVB-QPSK receiver (with 4-port RF switch) 15
  turbo PSK receiver (Broadcom protocol) 15
  turbo PSK receiver (with 4-port RF switch) 18
output
  absence of 73
  audio 10, 11
  composite video 10
  DTMF 12
overcurrent protection 26
overloaded circuits 26
overview of U4650 8

P

packet ID (PID) 22
packetized elementary stream 22
packing materials 25
PAL 22
parameter screens 87
parity setting 12
PAT 22
PCR 22
PES stream 22
phase-alternating-line (PAL) 22
phone number, customer service 83
physical description of Unity 4650 8
PID 22
pinouts, connector 30
PMT 22
polarity of alarm/cueing relays 13
port specifications
  Ethernet 12
  RS232 serial 12
power
  LNB 15
  rating of equipment 26
  specifications 9
power strips, use of 26
precautions for safety 19
presentation time stamp (PTS) 23
presets table 20, 22
program 22
program allocation table (PAT) 22
program clock reference (PCR) 22
program decompression 10
program map table (PMT) 22
program number 23
protected status 22
PSI table 23
PTS 23
pulse activation 46
pushbuttons 40
  functions of 40-??

Q

questions 83

R

rack
  earthing of 26
  mounting in 27
  spacing in 26
  total loading of 26
rack assembly, temperature of 26
radiated emissions, suppressing 25
radio interference 25
random access memory (RAM) 23
rear-panel connections 28
recovery 20
reduced air flow 26
relays, alarm/cueing 13
reliable earthing 26
return for repair 25
RF emissions 25
RF input specifications 14, 16
right arrow 40
RJ45 Ethernet port 12, 31
RMA number 83
routine operations 37
routing cables 27
RS232 serial ports 12
  pinouts of 31

S

safety 19
screen
  default 45
  download 45
  home 45
screws, anchor 27
SDT 23
security labels 19, 73
security of transport stream 20
selectable services 12
serial port
  specifications of 12
service 83
service department 83

service descriptor 23
SERVICES LED 45
services, selectable 12
setting up the U4650 25
shared status 22
shipping container 25
shipping the U4650 83
side vents 26
signal, time-base 22
signaling, DTMF 20
signal-to-noise ratio 20
size of chassis 13, 27
software
  application 19
  boot loader 20
  network control 20
spacing the unit in rack 26
specifications, U4650 9-13
splice points 19
standards, video 22
start bit 12
stop bit 12
storage temperature 13
stream 22
suggestions or comments 7
supply circuit, connection to 26
support, technical 83
suppressing emissions 25
synchronization 22
syntax, terminal command 48

T

T(MRA) 23, 26
table
  presets 22
  program map (PMT) 22
  PSI 23
  service descriptor (SDT) 23
tampering 19
technical support 83
temperature
  ambient operating 26
  MRA 23
  operating and storage 13
terminal monitoring and control 12
terminal operation 48
total rack loading 26
transport
  demultiplexing 9
  sync 46
transport in options 14, 29
TRANSPORT LED 45
transport stream 24
troubleshooting 73

U

Underwriter Laboratories (UL) listing 13
uneven mechanical loading 26
unpacking and inspection 25
up arrow 40
user cue relay 46
user-serviceable components 19, 73

V

ventilation of unit 26
video standards 22
voiding warranty 19, 25
voltage of supplied power 9

W

warning
  definition 24
WARNING LED 45
warranty 83
  voiding of 19, 25
width of chassis 13